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April 30th, 1947
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Washington Highlights

A strong countrywide representation of the oil and gas industry has arrived in Washington to bolster the fight for enactment of the Rizley bill. The measure is designed to keep within proper bounds authority of the Federal Power Commission over intrastate operations of the gas industry.

The bill, H.R, 2158, was introduced by Representative Ross Rizley of Oklahoma. It would make clear the words of the Natural Gas Act of 1938 to restrict the powers of the FPC to interstate distribution and sale of natural gas.

Supporters of the Rizley amendments charge that the FPC has moved into the domain of states and usurped powers that Congress did not mean to confer upon it by enactment of the Natural Gas Act.

Hearings before the House Committees on Interstate and Foreign Commerce drew witnesses from all gas producing states. The testimony generally maintained that the Natural Gas Act gave the FPC the right only to regulate transportation of natural gas in interstate commerce, sale in interstate commerce for resale for public use, and natural gas organizations engaged in transportation.

Influence of the FPC in this direction is not challenged. Petroleum leaders, argue, however, that the Federal agency, with support of the Supreme Court, has gone a great deal further and is regulating both production and gathering of natural gas. This has resulted in many oil and gas companies refusing to sell or deliver gas to pipe lines companies for fear of bringing themselves under FPC precepts.

Henry F. Grady of San Francisco has been sworn in as the first U. S. Ambassador to India. The oath of office was administered by Stanley Woodward, chief of the State Department's protocol division.

Grady indicated he would sail from San Francisco on May 2 to take up his new duties. He will spend several days at his California home first.

A secondary Recovery Forum will be held here on May 15. It will be sponsored jointly by the Department of Interior's oil and gas division and the Interstate Oil Compact Commission.

Julius A. Krug, Interior Department Secretary and Hiram M. Dow, Compact chairman, have extended joint invitations to some 100 industry committees and regulatory bodies, the Bureau of Mines, and interested individuals in all the nation's oil producing states.

Washington headquarters of the Independent Petroleum Association of America reported that petroleum products were consumed at a higher rate in the first quarter of 1947 than ever before in the history of the oil industry.

"The demand for all oil during the past three months evidently was approximately 10 per cent larger than during the same period of 1946," the association stated, "with gasoline up eight per cent, kerosene 15 per cent, light fuels 25 per cent and heavy fuel oils eight per cent."

The association pointed out that the unexpected rise in demand reduced stocks of these products since January 1 by about 30,000 barrels, a drop three times greater than the normal seasonal change.

If present production of domestic crude oil continues, the trade group said "a substantial reduction in imports will be necessary to bring total supply in balance with demand." Imports currently are averaging 200,000 barrels daily.

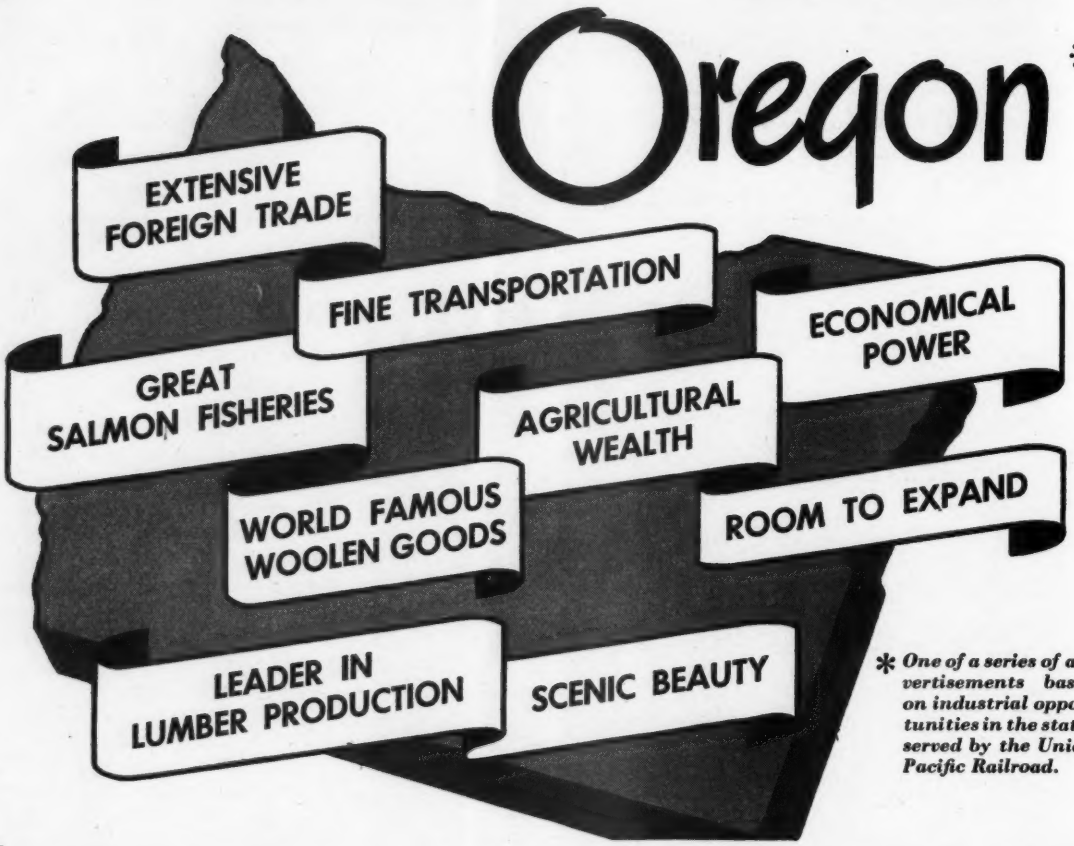
Signs in recent days have been indicative of the passing soon of three major wartime emergency agencies. President Truman apparently is preparing an executive order designed to complete the dissolution of the Office of Price Administration, Civilian Production Administration and the Office of War Mobilization and Reconversion. Rent controls probably will be transferred from OPA to the housing expediter.

The Office of Temporary Controls also will be wiped out. This agency was established last December especially for starting the liquidation program. Congress some weeks ago listed OTC and its sub-groups for the coup de grace by June 30.

UNION PACIFIC

TREASURE MAP OF INDUSTRY

Oregon*



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Huge Bonneville Dam assures ample and economical power. A new development program calls for four more dams. Oregon is noted for low electric rates.

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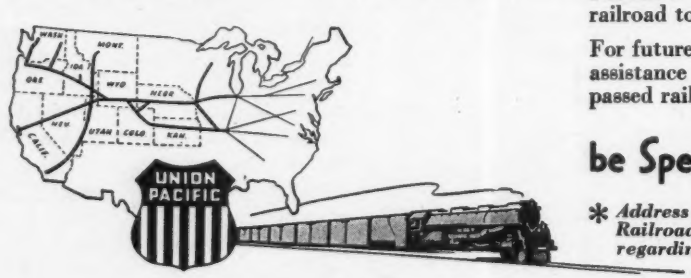

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UNION PACIFIC RAILROAD

THE STRATEGIC MIDDLE ROUTE

Improved Technique Facilitates Gravel Packing Operations

The methods and equipment used for gravel packing have been greatly improved since this procedure of well completion was introduced into the California oil fields more than a decade ago. Two methods of gravel packing a well are now being employed effectively. One is the circulated gravel pack by means of which the gravel is pumped down the well to its position around slotted liner after the liner has been run into the well. The other is the use of slotted liner which has been pre-packed with gravel before it is lowered into the hole. Only the circulated gravel packing method is herein discussed; but this does not imply that the pre-packed liner does not have certain advantages, particularly in areas where equipment for the circulation of the gravel is not readily available.

Gravel packing is employed, of course, to obtain a better completion than can be obtained by a conventional completion under certain formational conditions. In using the term completion we include recompletion or repair work of an augmented nature. Some operators limit their conceptions of the value of gravel packing to the prevention of sand infiltration and the subsequent reduction of maintenance costs by the gravel pack. Although this elimination, or reduction to the minimum, of sand troubles is an extremely important function of gravel packing, it is by no means the only one. In many wells, sands and shales are interbedded and the sands are unconsolidated. The shales are undermined as the sand filters out and there is danger of collapsed liners or plugged perforations. When producing formations are shaley in character, there may be a tendency to shift if the formations are not supported. Here again is the hazard of collapsed liner or plugged perforations. In some sands the cementing material may disintegrate during prduction and, while the wells may produce little or no sand, cavities may form and allow shale fragments to slough against the perforations and restrict the flow of oil.

Sand infiltration must, of course, be given the serious consideration it deserves. In addition to the frequent pulling jobs which such infiltration makes necessary, the sand will cause abrasion on the perforations; on both inside and outside of tubing; on pump plungers and valves; and on surface connections and fittings, particularly if the well is flowing. The sand not only fills up inside the liner, shutting off the flow of oil into the well, but will frequently fill up inside the tubing. Disposal of the sand itself after it has been bailed out of the well is sometimes an expensive item.

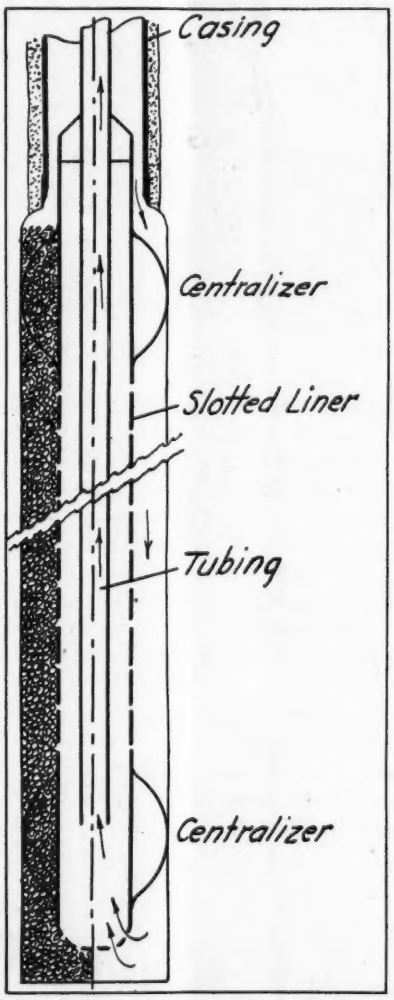

Figure 1
Showing general method of gravel packing liner after it has been run into the hole. The left half shows the gravel after it has been placed. The right half shows the well before pumping in the gravel. The arrows indicate the flow of gravel and fluid down through the annulus around the slotted liner and the return of the fluid through the shoe and up the tubing to the surface.

The chief purposes of gravel packing are, therefore, to support the walls of the hole and to prevent the migration of sand into the well. However, the gravel pack is placed in an enlarged hole and this greater area has an effect that has probably been given little attention. In addition to a larger drainage area which the enlarged hole provides, the increased size offers advantages of lower velocity and pressure necessary to move the oil into the well; moreover, the gravel-packed annulus between the liner and the walls of the hole provides a highly permeable chamber to aid in gas separation before entering the liner, thus contributing toward pump efficiency.

The effectiveness of gravel packing depends on the bridging action of the sand across the interstices of the gravel. There must therefore be a relationship between the size of the gravel and the size of the sand grains. When gravel packing was first employed, theory alone had to be used to determine the size of gravel to use with a certain sand. Extensive research work and practical experience based on results achieved over a long period have now provided data by means of which the gravel size can be readily determined.

Casing and Liner

There are several variations of the methods employed in placing a circulated gravel pack. The general procedure is shown schematically in Figure 1 which does not indicate any of the actual equipment used. At the present time the operations are being performed in slim hole with small casing or in large hole with large casing.

Inmost wells, 8⅝-in. water strings have been cemented and either 5½-in. or 6⅝-in. liners have been

1922·1947

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★ Between 1922 and 1926 the business grew from its one office in Los Angeles to a system that combined both sales and warehouse facilities. In the latter part of this period a field store was opened at Taft, the first of several that were to be established in the major California oil fields.

★ The year 1929 saw the opening of a sales office and warehouse in San Francisco, this company being the first of the oil well supply houses to enter this area. Since then the company has steadily increased its facilities. It now operates 10 stores serving Ventura, Signal Hill, Wilmington, Santa Fe Springs, Taft, Bakersfield, Santa Maria, Castaic, Avenal, Rio Vista.

In February, 1945, the company was purchased by Bethlehem, and on January 1, 1947, the name was changed to Bethlehem Supply Company of California. Under this new name the company will continue to improve and expand its service to the oil industry as it has during the past quarter of a century.

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run to lap into the casing in the conventional manner. After gravel packing, either an adapter is set or the liner is hung. In some cases 8⅝-in. liners have been used in 10⅝-in. or 11¾-in. casing. Sufficient clearance must, of course, be provided for passage of the gravel between the liner and casing before the gravel passes into the enlarged hole below the water string.

Methods have been developed whereby the gravel can be circulated into place where a 6⅝-in. or 7-in. water string and the 5-in. liner is liner landed on bottom. One method of doing this is to make up the 5-in. liner so that its top will be from two to four feet below the shoe of the 6⅝-in. casing. After the gravel has been placed around the liner, the liner is picked up and hung in the shoe joint of the casing. Another method utilizes a joint of 9⅝-in. casing on the bottom of the 6⅝-in. water string and the 5-in liner is made up so that its top will be halfway up the 9⅝-in. pipe. When the gravel is in place, a 5-in. adapter joint is set down on top of the liner whose top is then brought up into the 6⅝-in. casing. Adequate clearance is thus provided for circulation of the gravel in both cases.

It has been the general practice in the past to plug off the perforations of the liner with a chemical or clay or to provide a wash-pipe and swab-rubber assembly to prevent the fluid from leaving the gravel before it is placed. When the perforations are plugged for the gravel packing operation, they are opened, after the gravel is in place and the tubing removed, by string shooting or by acidizing. Recent practice in California has been to take no precautions against denuding the gravel of fluid by covering the perforations. The wash pipe is extended a considerable distance into the liner and no trouble has been experienced. In Figure 1 a perforated shoe is shown on the liner, but this is not usually necessary since the returning fluid can enter the liner readily.

The liner should be equipped with centralizers to keep it in the center of the hole and make sure that no perforations are in contact with the formation. A uniform and complete pack of gravel around the liner is necessary if the gravel is to be effective.

Gravel Packing Procedure

The hole is drilled to bottom either before or after the water string is cemented. This hole is wall-scraped to the desired diameter, frequently to 20 inches. A caliper log should then be run to make sure the hole is properly wall-scraped and to provide for making an estimate of the volume of gravel and that will be taken. Following this, the liner is run into the well on tubing or drill pipe.

Up until recently the mixture of gravel and fluid was pumped down the annulus between the tubing (or drill pipe) and the casing by reverse circulation, the fluid returning to the surface through the tubing. A new device is now being used in California which utilizes both direct and reverse circulation for the placement of the gravel. The tool, which is a cross-over device, is shown in Figure 2. This sketch is schematic and illustrates merely the principle of the method employed.

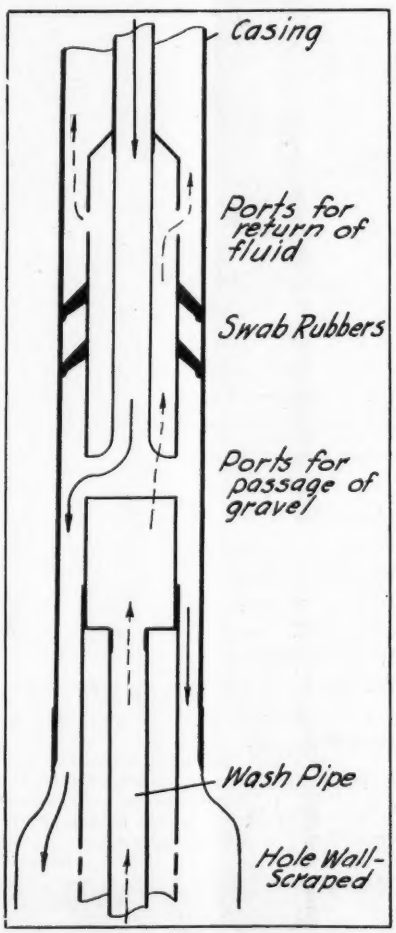


Figure 2

A recently developed device to facilitate gravel packing operations. The solid arrows indicate the flow of gravel and fluid as the mixture is pumped down the hole. The broken arrows show the return of fluid to the surface.

When using the cross-over device, the gravel-fluid mixture is pumped down through the tubing (or drill pipe) until it reaches the ports through which it passes out into the annulus between the device and the casing. Swab rubbers placed above these gravel discharge ports prevent the mixture from moving upward and thus insure its passage down into the enlarged hole in which the liner is set. A wash pipe is attached to the bottom of the tool and as the gravel builds up behind the liner the fluid enters the bottom of the wash pipe.

When the fluid passing up the wash pipe reaches the cross-over device it flows around the discharge tubes that carry the gravel from the tubing (or drill pipe) to the gravel discharge parts and goes on up until it reaches the fluid outlet ports. It passes through these ports into the annulus between the tubing (or drill pipe) and the casing and flows up to the surface. The swab rubbers are below these fluid ports and prevent downward movement of the fluid, effectively controlling the direction of flow of the circulation.

After all the gravel is in place behind the liner, circulation is reversed and any gravel remaining in the tubing is back-scuttled out. The tubing (or drill pipe) is connected to the cross-over device by left-hand, square threads and is easily disconnected and pulled out of the well. An adapter is then run and the production string installed.

Circulating Fluid

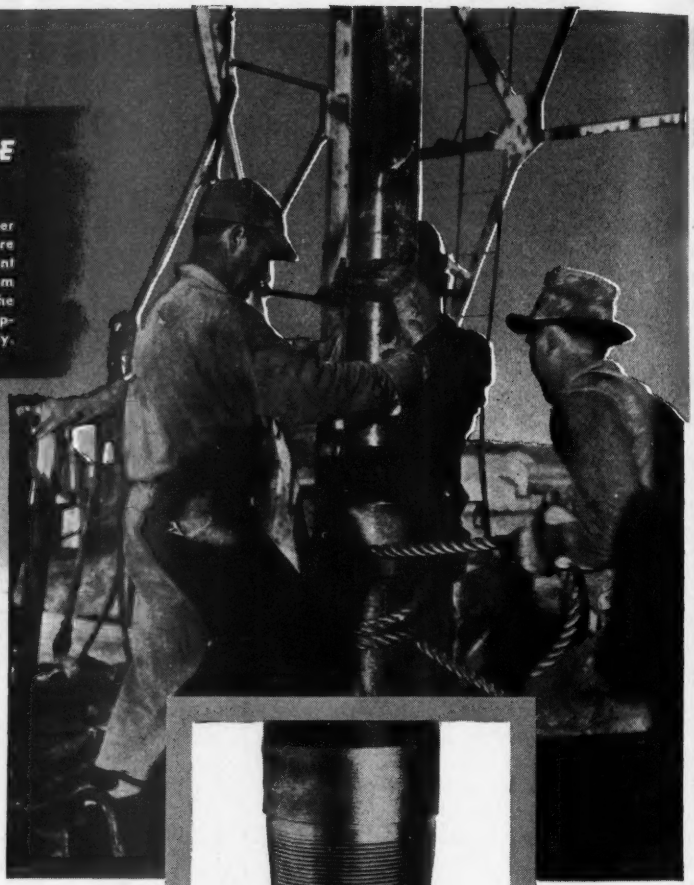
Although many types of mud have been used as the circulating fluid with which the gravel is mixed for its placement, care should be taken to make sure the mud will not cause even a temporary harmful effect. The mud must, of course, have satisfactory properties of viscosity, weight, water-loss and wall building. Crude oil and oil-base muds have been employed to some extent.

Many wells have been gravel packed with a mixture of prepared

(Continued on Page 34)

A TIP ON HOW TO IMPROVE CASING PRACTICE . . .

To insure proper makeup and to prevent galling, proper lubrication of threads is highly important. Extreme care must be exercised to prevent contamination of lubricant by any foreign matter, particularly sand and grit from derrick floor. The brush and utensil used in applying the lubricant must also be kept free of foreign matter. A proper lubricant should permit the joint to screw up smoothly.



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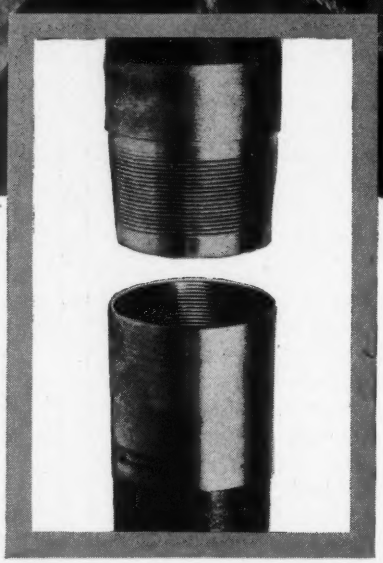

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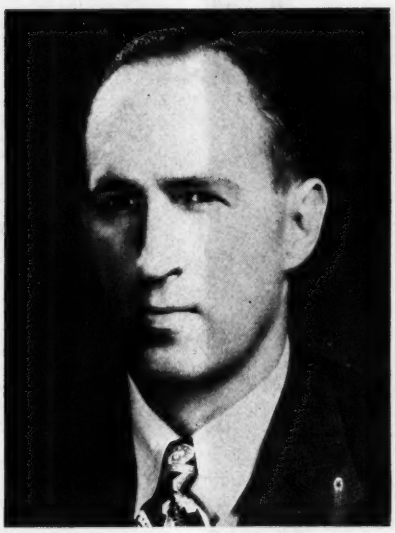
Fluidynamics and Thermodynamics of Hydrocarbon Separation Processes

By Wayne C. Edmister
Hydrocarbon Research, Inc.
115 Broadway, New York

March Meeting



Wayne C. Edmister

INTRODUCTION

Processes for the separation of hydrocarbon mixtures into components or fractions for further processing and/or marketing are the backbone of the natural gasoline, petroleum refining and petro-chemical industries. Since separation equipment represents a substantial fraction of the plant investment costs and since separation efficiency is an important factor in operating cost for any hydrocarbon processing plant, this subject can hardly receive too much attention.

Separation like other processing operations requires energy, in one form or another, to carry out the work of separation and supply the difference in enthalpy of products and feed. As a consequence of the work of separation a portion of the energy supplied is rejected at a low temperature. In addition to involving energy, hydrocarbon separation operations involve the equilibrium and the rates of material and energy transfer. The quantities of energy supplied and rejected and the temperature levels at which these energy transfers occur together with phase equilibrium and component concentrations determine the thermodynamic efficiency of a separation process.

Hydrocarbons may be separated by mechanical or diffusional processes. Although mechanical processes such as filtration, centrifugalization, and precipitation are used rather extensively in petroleum refining, mechanical separation is outside the scope of this discussion. The separation mechanisms of interest in this discussion are vaporization and diffusion both involving liquid and vapor phases. The interphase transfer of components by these means depend upon the concentration difference, the equilibrium of the two phases, and the time of contact. There are three efficiencies of interest in the design and operation of hydrocarbon separation process; namely, plate efficiency, thermodynamic effiiciency and the component separation or recovery efficiency.

The objective of this paper is to summarize fundamental concepts of vaporizational and diffusional processes, to review some of the important contributions made in this field, and to outline a plan or pattern to be followed in developing process design methods and procedures for making hydrocarbon separation calculations. Accordingly, this discussion starts with the fundamental equations and stops short of giving illustrating examples. The development of the theoretical equations and the preparations of the finished working charts and also the detailed design calculation procedures are outside the scope of this paper.

The types of separation of interest in this discussion are continuous processes functioning thru multistage contacting of liquid and vapor phases to effect an interphase transfer of material. This includes absorption, fractional distillation, etc., where vapor and liquid are brought into contact at successive stages by bubble plates, which are usually the bubble cap type but may be a perforated plate. Separation processes of this kind have been in use in the petroleum industry for many years so the commercial operation of separating hydrocarbons by fractional distillation and absorption are not new by any means. Although today's hydrocarbon separation "know-how" is appreciable, there is still too much guesswork involved in making design calculations, particularly for special new or previously untried separations. Considerable progress can be made in perfecting design methods and improving of the efficiency and economy of separation processes by following a coordinated program. Some of the development work necessary merely involves gathering of loose ends and correlating existing knowledge for more effective and consistent application to design problems. This type of development work should be supplemented by additional laboratory and plant developments.

Contributions to our knowledge of hydrocarbon separations have come from many sources, as indicated by the list of references included at the end of this paper, and this will undoubtedly continue. Coordinated development studies thru committees and technical societies could correlate the results of all the scattered research in this field and also make future work more consistent and fruitful. The lack of a standardized theoretical plate and component distribution calculation method required for analyzing plant performance data, makes it almost impossible to fit results of several investigators together into one correlation. For example, light hydro-

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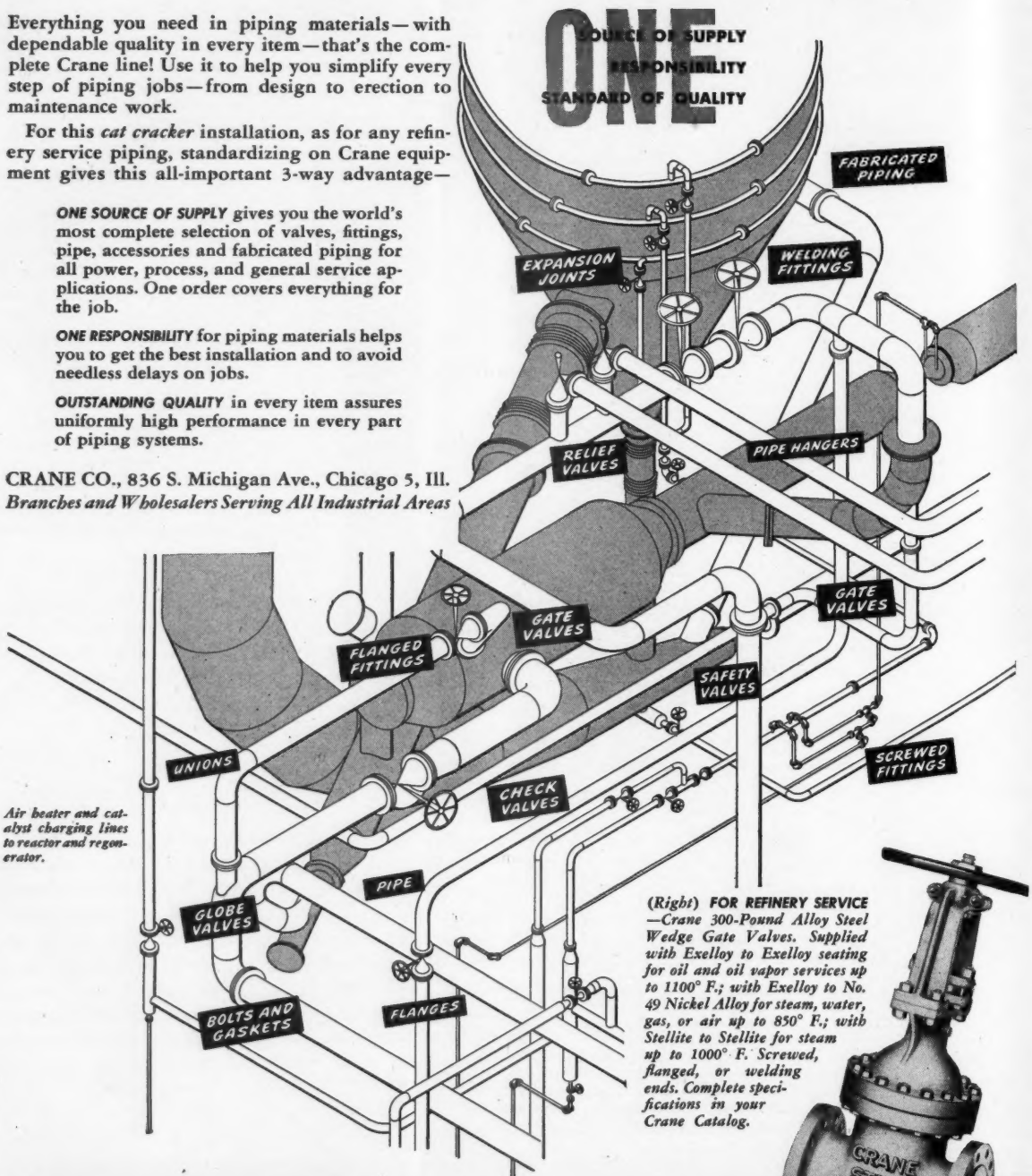

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carbon fractionator test data might be analyzed to obtain plate efficiencies by using equilibrium vaporization constants obtained from: (a) vapor pressures and total pressures, (b) ideal fugacities, or (c) fugacities corrected for deviations from ideal solutions. These three types of equilibrium data would give different plate efficiencies, each of which would be limited in application to calculations employing the same type of phase equilibrium data used in obtaining the plate efficiencies by analysing performance data. The same need for consistency applies to the enthalpy data and also to the method of making component calculations.

The liquid and vapor rates, the flow pattern, and the bubble cap details, as well as the feed stock characteristics affect the plate efficiency as well as the column capacity. Although some work has been done on allowing for the effects of these mechanical variables on the plate efficiency, more emphasis has been put on the feed stock properties. Liquid and vapor flow rates and maximum capacities are also obtained by analysing plant performance data, which analyses require enthalpy and equilibrium data. From the foregoing it can be seen that all of the factors and methods used in testing and designing are interrelated. It is obvious that a firm theoretical foundation of thermodynamics and fluidynamics, including a theoretical calculation method are required in order to make real and satisfactory progress in this field.

A hydrocarbon separation process currently receiving a great deal of attention is Hypersorption, which has been described by Berg (5). Being a steady flow operation involving gases and moving charcoal and with heat being added and removed continuously, the theoretical calculations for this process involve the same basic fundamentals, with proper adjustments for the equilibrium between the gases and the adsorbent. This process, as well as extraction and azeotropic distillation are cited as references in this paper although most of the discussion pertains to the more common processes, absorption and fractionation.

As stated above, this paper is concerned with hydrocarbon separation processes that operate in the liquid and vapor phases and utilize bubble plate stages in a column for contacting the two phases. Typical and most common of this type of process are fractional distillation and absorption with stripping. The same basic principles, with proper adjustments, hold for extractive and azeotropic distillation. Concentrating on absorption and fractionation makes it possible to illustrate practically all of the important points that are of interest in this discussion.

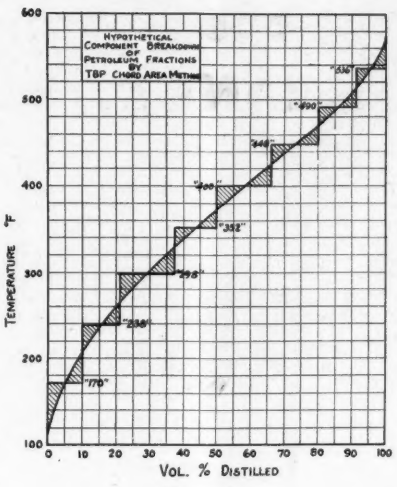

Figure 1

The process design of hydrocarbon absorption and fractionation equipment involves the following three related steps: (I) theoretical plate and component distribution calculations, (II) estimation of the plate efficiency and the actual number of plates, and (III) sizing the column, its plates and auxiliaries for capacity. More specifically design calculations involve the following items: (a) vapor-liquid equilibria, (b) component material balances, (c) heat balances, (d) plate efficiency and number, (e) reboiler duty, (f) reflux quantity, (g) vapor velocity, (h) liquid downflow capacity, (i) bubble plate details and spacing, and (j) location of side streams. With liquid and vapor flowing in opposite directions while transferring heat and material from one phase to the other, we have an excellent subject for applied fluidynamics and thermodynamics as can be appreciated from these various calculation steps. It should be borne in mind that thermodynamics does not deal with rates, but is limited to energy and equilibrium, in which respects it is of appreciable help in hydrocarbon separation calculations.

FUNDAMENTAL CONCEPTS

All vapor-liquid type hydrocarbon separation processes function thru a concentration difference between enriched and depleted streams and the multiplication of this by countercurrent contacting of the vapor and liquid in **differential** or **stage** operations. Both of these operations are carried out in vertical columns, with the vapor flowing up and liquid flowing down. A packed column gives differential contacting with true countercurrent flow while a bubble plate column gives stage contacting with equilibrium approached on each of a series of stages and with countercurrent flow of liquid and vapor between but not within each stage.

The heart of all vapor-liquid type separation processes is the contacting device, where the interphase transfer of heat and material takes place. With countercurrent flow in packing, the interphase transfer of heat and material takes place differentially while the enriched and depleted streams are moving in opposite directions. Although the relative volatilities of the components being separated are important, this process is not an equilibrium operation. At any point the concentration of both phases are far removed from equilibrium conditions. With bubble plates on the other hand, the interphase transfer of heat and material takes place by stages, while the enriched and depleted streams are mixed on each stage and then separated to flow in opposite directions to the next stages.

In a packed tower a better overall driving force is obtained for the interphase transfer of heat and material than is possible by a series of equilibrium stages with counterflow between stages but not within each stage. Because of the different mechanisms of interphase transfer, i.e. **differential** vs. **stage**, packed and bubble plate columns are considered separately, using different theor-

Continental to build small TCC unit at Denver

THIRD SMALL TCC LICENSED SINCE WAR WILL BE FIRST CAT-CRACKER IN COLORADO

As an important part of a $4,000,000 construction program to enlarge its Denver refinery, Continental Oil Company has contracted to build a new small T C C unit of 3,300 B/D fresh feed capacity. Engineering and design of the new unit are already under way and its completion is scheduled for early 1948.

Although the new unit will be the first cat-cracker to be built in Colorado, it will be Continental's fourth T C C, three others of larger capacity having been operating since early 1944 in the company's Ponca City refinery. Improved features of design and construction, which will be incorporated in the new unit, will provide a higher yield of motor fuel than any single catalytic cracking unit in existence.

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etical approaches and getting different calculation methods. In some special cases, i.e. where plate efficiencies of 100% are approached, the **stage** calculation method may be applied to packed columns, which is an advantage because of greater ease in making the computations. Because of capacity limitations packed towers are not used for large hydrocarbon separation jobs. A packed column can be much shorter for a given separation but at the same time it must be of larger diameter because of lower allowable vapor velocities for packed columns. Uniform liquid distribution is difficult, if not impossible to obtain in a packed tower of large diameter. Uneven distribution causes channelling, which nullifies the advantages of packing. Since most commercial hydrocarbon separations are of large scale, bubble plate stages must be used.

It is important that the countercurrent nature of bubble plate stage operations be clearly understood. Commercial units are built in the form of towers with the successive stages consisting of bubble trays, with liquid flow across the plate and vapor flow thru the plate. The flow between stages is countercurrent but this does not make the process a true countercurrent process. The reason for this is that the two phases do not flow countercurrent, but equilibrium is approached on each stage. It can be readily appreciated that this operation is different from the mechanism existing in a packed column where a truly differential countercurrent contacting occurs.

Stage contacting of this kind may take place with phases in equilibrium if the contact device and the fluid properties permit. For example: Equilibrium between the vapor and liquid is reached or approached more closely on the plates of a light hydrocarbon fractionator than in a crude distillation column or an absorber. Plate efficiencies are so low for absorption that it can hardly be considered an equilibrium process even though it is carried out by multistage contacting. For absorption, diffusional resistances are controlling rather than relative volatility, as in the case of fractional distillation.

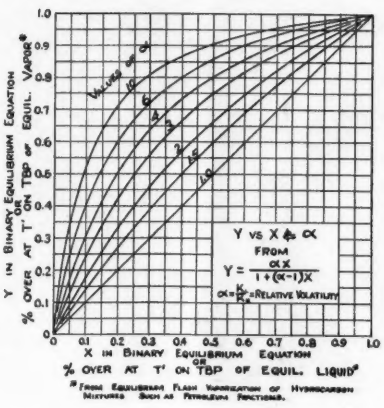
Y IN BINARY EQUILIBRIUM EQUATION OR % OVER AT T' ON TBP OF EQUIL. VAPOR*
X IN BINARY EQUILIBRIUM EQUATION OR % OVER AT T' ON TBP OF EQUIL. LIQUID*
VALUES OF α
Y VS X @ α FROM
Y = αX / 1+(α-1)X
α = K_A/K_B = RELATIVE VOLATILITY
* FROM EQUILIBRIUM FLASH VAPORIZATION OF HYDROCARBON MIXTURES SUCH AS PETROLEUM FRACTIONS.

Figure 2

The distance from a state of equilibrium determines the driving force for interphase transfer of components. This distance is established by the relative volatilities and the concentrations of the components being separated. Or expressing it another way, the slopes of the equilibrium and operating lines.

Although equilibrium is not always reached it is important to know how to estimate the equilibrium conditions. This may be done in two ways, the component method or the empirical method, the component method being based on either ideal fugacities or fugacities corrected for deviations from ideality, while the empirical method is based on experimental data entirely. In the component method the phase equilibrium is expressed by the ratio of mol fraction in vapor to mol fraction in liquid and the ratios of these K constants for any two components is the **relative volatility** or the **separation** factor. As will be shown later, the slope of the T.B.P. distillation curve, which is used in the empirical method, is related to this relative volatility separation factor.

Energy is required to maintain interstage flows of liquid and vapor and to provide for the energy increases of the products that usually accompany fractional distillation. This energy is supplied in the form of heat and pumping power. In absorption the heat energy is used in stripping the rich oil in a separate column. This brings up the subject of thermodynamics and the question of reversibility. The work and heat energies added and rejected and the temperatures at which these energy transfers take place plus the entropy and enthalpy changes of the fluids being separated determine the thermodynamic efficiency of a separation process.

An important concept of separation processes is the degree of reversibility which is an interesting basis for comparing separation processes, as was done recently by Benedict (*2*) who classified all separation processes into: **potentially, partially,** and **non reversible** processes. Fractional distillation is a potentially reversible process, while absorption is a partially reversible process. The degree of reversibility of absorption is not as high as fractionation because the lean oil is not in equilibrium with the off-gas. The additional energy required to strip the solvent to this point increases the energy required and decreases the efficiency.

The graphic method of McCabe and Thiele (56) for the solution of the stepwise calculations for binary mixtures is a classic and might be considered as a part of the fundamental theory rather than just a calculation method. For years, process engineers have been seeking a similar short-cut method for multicomponent mixtures such as petroleum hydrocarbons. Several such methods have been proposed but not very widely accepted. All involve modifying either the operating or equilibrium lines to correct for the presence of the other components.

The McCabe-Thiele XY diagram method is very useful in analyzing the flow pattern of a bubble tray to find its effect on efficiency and in estimating the effect of entrainment on plate efficiency and in making many other graphical studies for binary systems. The results of such studies are applicable to multicomponent systems as well but very difficult to evaluate directly for multicomponent systems.

Another classic in this field is the Kremser (52) absorption factor method originally proposed for absorption and stripping calculations but used in short-cut fractionation design methods as well. The absorption factor, being the ratio of the slope of the operating line to the slope of the equilibrium line, is

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a fundamental concept of theoretical significance and practical utility. Although the earlier short-cut fractionation design methods based on the absorption and stripping factors are not reliable enough for accurate calculations, there is no reason why this L/KV factor cannot be used in this type of work, providing of course that proper allowances and corrections are made in applying it.

To a certain degree, the method used in estimating the number of theoretical stages required for a given separation depends upon the character of the feed stock and the desired products. For light hydrocarbon separations, component calculations are usually made. For the kerosene and gas oil range empirical methods based on the T.B.P. or ASTM may be adequate. For vacuum distillation, to produce lube distillates or asphalts, pilot laboratory runs are usually required. Thus it can be seen that hydrocarbon separation is a very large subject where many different methods must be used in design. Only a general treatment of this subject is possible in the time and space available here.

Summarizing, the following fundamental concepts forming the basis for the theory and design of hydrocarbon fractionation and absorption:

(a) Phase equilibrium and relative volatility.

(b) Addition of energy at a high level for reboiling and pumping to maintain interstage flows.

(c) Removal of energy at a low level to condense products and reflux to maintain interstage flow.

(d) Simultaneous component material balances and phase equilibrium or diffusion calculations from stage to stage to determine the number of stages and component distribution.

(e) Equilibrium efficiency for the bubble plate contacting stages, as determined by the fluid properties and the mechanical details.

PHASE EQUILIBRIA

As pointed out above, the equilibrium relationship between liquid and vapor is one of the factors determining the driving force for interphase transfer of components in hydrocarbon absorption and fractionation and the relative volatility determines the ease of separating two hydrocarbons by simple distillation. Phase equilibrium has received considerable attention during recent years, as indicated by the literature, a few references being given here (20, 27, 47, 49, 51, 61, 68, 94). Phase equilibria conditions may be predicted by component or empirical methods, depending upon the characteristics of the mixture and the problem. Component methods are used in calculating phase equilibrium of light hydrocarbon mixtures. Empirical methods are used in estimating phase equilibrium for higher boiling petroleum fractions. The primary consideration in deciding between the two methods is the complexity of the mixture and the ability to break it into actual or hypothetical components. In the heavy gasoline and naphtha range, phase equilibria calculations may involve mixtures that are known by component composition for part of the mixture and by distillation curve for the balance. For this type of system neither the empirical or component method is suitable until the light ends are translated into a hypothetical distillation curve or the heavy ends are broken into hypothetical components. The latter method is usually used because it is frequently necessary to compute the composition of the equilibrium vapor or liquid.

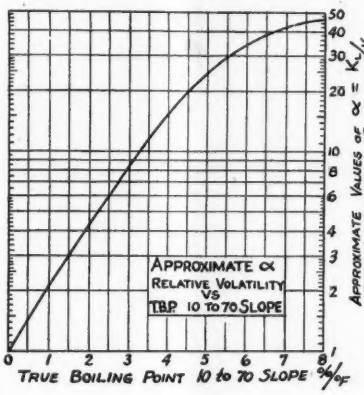
APPROXIMATE α RELATIVE VOLATILITY VS TBP 10 TO 70 SLOPE
TRUE BOILING POINT 10 to 70 SLOPE °F
APPROXIMATE VALUES OF α = K_V/K_H FOR ATMOSPHERIC PRESSURE
0 1 2 3 4 5 6 7 8
50 40 30 20 10 8 6 4 3 2 1

Figure 3

Figure 1 shows a method of breaking a petroleum fraction into hypothetical components by using the "chord area method." Each plateau represents a hypothetical component, identified by its average boiling point. In order to make component phase equilibria calculations using this breakdown, it is necessary to estimate the characteristics and volatility properties of each hypothetical component. This can be done from the gravities and boiling points of each hypothetical component. If a gravity versus percent vaporized curve is not obtained with the true boiling point distillation, the gravities may be estimated knowing the gravity and the character of the whole mixture. Molecular weights and critical constants are readily obtained from correlations involving gravities and boiling points as the characterizing variables. Having criticals and vapor pressures for these hypothetical components, fugacities of the liquid and vapor phases are estimated from f/P correlations, which are developed from P-V-T data plus some experimental phase equilibria data.

The hypothetical component method, described above, involves a great deal of work. However, it could be made much simpler by developing charts giving the fugacity phase equilibrium constants for hypothetical components that are characterized by gravity and boiling point. This would not be a very difficult task. Once accomplished the resulting charts could be used in analysing performance data with much more consistent results.

Another equilibrium constant development necessary for consistent and accurate fractionation and absorption studies, is the deviation from ideal solutions. For absorption at moderate pressures it is possible to use ideal phase equilibria constants. In cases where the pressure is very high or the lean oil is aromatic, the correction to the fugacity phase equilibrium constant becomes appreciable. For example, the absorbers used in recycle plants require special phase equilibrium handling. The same is true of ex-

tractive distillation where the solvent alters the effective relative volatility of the key components. Kirkbride and Bertetti (51) presented experimental data on the equilibrium constants of several light hydrocarbons in paraffinic, naphthenic and aromatic absorbing oils at pressures up to 3000 p.s.i.a. This work showed that paraffinic lean oil is least selective in absorbing pentane from methane, while the aromatic lean oil is most selective.

Corrections for the deviations from ideal solutions are not easily made, because the corrections necessary should theoretically be made to the fugacities of the liquid and vapor phases, separately, because these corrections are functions of the composition of the phase concerned. Thus, it is necessary either to know or guess these phase characteristics in order to permit estimating the fugacities. A more direct technique is the convergence pressure method, which was proposed and described by White and Brown (94). There is a need for consistent and accurate charts to make these phase equilibrium calculations. As a part of this program, the critical conditions of hydrocarbon mixtures will be involved and as a by-product of the work an improved method of estimating critical conditions should evolve.

This naturally leads to the empirical method of estimating phase equilibrium. In this method the quantities of equilibrium vapor and liquid and the properties of these products are estimated from the ASTM or TBP distillation properties of the charge stock by means of empirical correlations developed from experimental flash vaporization data obtained from bench-scale or pilot-plant apparatus or from commercial units. This technique was first proposed by Piromoov and Beiswenger (68) for use in making crude distillation calculations and has been very useful in making various kinds of petroleum equilibrium calculations. Although several technical contributions (27, 47, 61, and 92) have been made on this subject during the past eight years since it was proposed, there is still no reliable method available for accurately estimating equilibrium conditions at various pressures and predicting for properties of equilibrium vapor and liquid. Katz and Brown (47) suggested a method of correcting the flash curve to higher than atmospheric pressure and Obryadchikov (61) presented a correlation of the distillation properties of the equilibrium vapor and liquid. Although these contributions do not solve the problem they do suggest possibilities for further work.

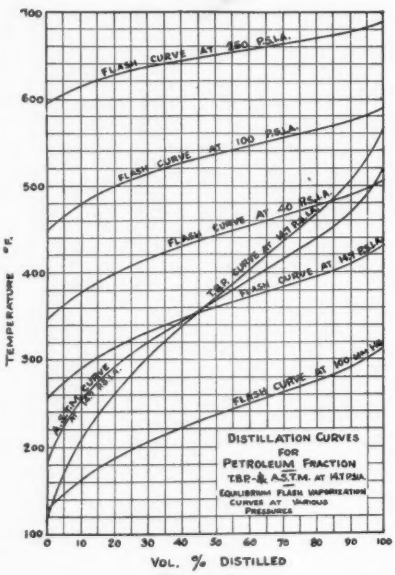

Figure 4

In developing and using empirical phase equilibrium methods, such as the flash vaporization correlations, the question arises as to whether equilibrium is actually reached or not. Continuous flash vaporization experiments have been run at different rates by this author (27) and no effect of time was found for the range covered. Of course, the important consideration is the application of the resulting correlations in design and it might be stated that the uncertainty as to the closeness of approach to equilibrium cancels out since the correlation is merely a mechanism of going from one set of operating conditions to another. This is true within limitations. If the empirical flash vaporization correlations were based on experimental data where equilibrium were not actually reached, then this method could not be used with plate efficiencies developed by applying component phase equilibrium calculations to plant performance data.

Another point in this connection is the clumsiness of using an impirical phase equilibrium method in any of the conventional multicomponent calculation methods. This difficulty could be avoided by developing a fractionation design method around the empirical phase equilibrium method found to correlate actual flash vaporization data most accurately. Such a combination would probably be empirical throughout and might involve expressing separation in terms of boiling point (initial, average, and/or final) properties of the feed and products. Another method would be to develop an empirical method of predicting phase equilibrium constants, which would express equilibrium in terms of component composition and therefore be convenient for use with existing theoretical plate calculation methods, or perhaps a compromise might be best. The point is that both the methods of estimating equilibrium condition and of calculating theoretical plates should be considered together when deciding what technique to use for predicting phase conditions. To a lesser degree this also applies to pressure drop as well.

The empirical and component methods of estimating phase equilibrium are naturally related and should give the same results when applied to the same problem, as could be done by the hypothetical component technique illustrated by Figure 1. The relationship that exists between the empirical and component phase equilibrium methods is illustrated in another way by Figures 2 and 3, which are also of interest in fractionation calculations as well as flash vaporization.

In Figure 2 the binary equilibrium equation is plotted, giving Y vs. X for lines of constant relative volatility $\alpha = K_L/K_H$ (where K_L and K_H are phase equilibrium constants for the light and heavy components respectively.) The equilibrium equation and the use of this chart in making fractionation calculations will be discussed further later. At this point it is sufficient to say that the XY or equilibrium curves shown on Figure 2 are of the type used in the McCabe-Thiele graphical meth-

od. The numbers on the curves indicate the values of constant relative volatility for that particular curve. Relative volatility is not always constant for a given binary distillation but for these purposes it is convenient to use a constant relative volatility.

Similar charts to the ones shown on Figure 2 may be obtained by plotting the per cent over at a given temperature on the true boiling point curve of the equilibrium vapor versus the corresponding point for the equilibrium liquid. The scales of Figure 2 are labeled accordingly to demonstrate this feature. When a plot of this type is constructed, the parameter is a function of the slope of the true boiling point curve of the charge as shown in Figure 3. This phenomena was first pointed out by Obryadchikov (61) who proposed this type of XY diagram as a method of making stepwise fractionation calculations for petroleum stocks. This is the component empirical link referred to above. The X and Y scales of Figure 2 are titled in two ways to indicate the dual use of these curves. In order to apply this graph to the estimation of the TBP distillation properties of the equilibrium vapor and liquid, the proper α line must be used. This depends on the slope of the TBP distillation of the charge. Equivalent values of α for different TBP slopes were found by Peters (67) by constructing plots such as Figure 2 for several stocks from laboratory data and then comparing values of α and TBP 10 to 70 slope. This relationship is represented graphically in Figure 3, which gives values of α that are approximate and applicable only at atmospheric pressure. For higher pressures, corrections must be made.

A single curve on Figure 2 scales represents the relationship between the distillation properties of the equilibrium vapors and liquids formed by the flash vaporization of a given stock, corrections being required for pressure of course. Obryadchikov (61) constructed such plots for both the T.B.P. and A.S.T.M. properties of the equilibrium vapor and liquid. The A.S.T.M. equilibrium curves are irregular and unsymmetrical and of little

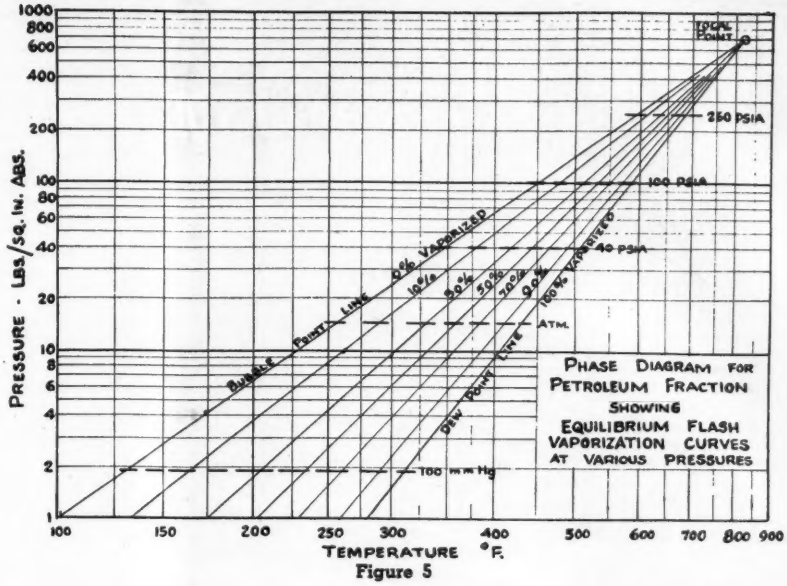

Figure 5

interest in this discussion.

Such plots as this condense a great deal of information on one graph but have the disadvantage of being difficult to unravel in estimating the distillation properties of any unknown equilibrium vapor or liquid. This is because temperatures drop out in the plotting. Temperatures can only be estimated by combining the readings from this correlation with the quantities of equilibrium vapor and liquid and the corresponding temperatures on the distillation curve of the charge. A more direct correlation is preferred for predicting the distillation properties of equilibrium vapor and liquid.

The empirical method of estimating phase equilibrium is illustrated by Figures 4, 5 and 6, all for the same petroleum fraction, which is the same stock broken into hypothetical components on Figure 1. On Figure 4 distillation curves of the stock are shown at different pressures. At atmospheric pressure three curves are shown; the T.B.P. curve, the A.S.T.M. curve and the flash vaporization curve. The A.S.T.M. and T.B.P curves represent batch distillations of the stock, but the flash curve represents a series of continuous flash vaporization runs, ranging from 0 to 100% vaporized. The flash curves at the other pressures represent the same continuous flash vaporization data at other pressures. Taken collectively these flash curves give a PTX relationship for the stock. This PTX relationship makes into the phase diagram shown on Figure 5, where dashed lines indicate where the curves shown on Figure 4 are cut across the border curve. The lines of constant per cent vaporized intersect at a focal point which is not to be confused with the convergence pressure or the pseudo-critical point.

If T.B.P. distillation curves are obtained for the equilibrium vapor and liquid from flash vaporization of this petroleum fraction, the resulting curves are like those shown on Figure 6, where T.B.P. curves for vapors and liquid from three different flash vaporizations are plotted. This is the type of data that can be plotted as in Figure 2. The petroleum fraction used in preparing Figures 1, 4, 5, and 6 has a T.B.P. 10 to 70% slope of 3.8. From Figure 3 an approximate value of α for this stock is found as 15. Using this α value and the binary equilibrium equation, an XY curve may be computed and plotted on Figure 2. This curve will coincide with a curve plotted from the data on Figure 6. Points from the vapor and liquid curves of all three flash vaporizations can thus be consolidated into one curve on Figure 2 in this manner.

The relative volatility is the ratio of the phase equilibrium distribution constants for two components and may be considered the separation factor for fractional distillation.

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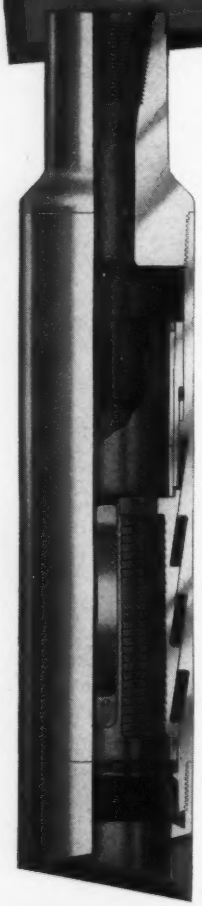

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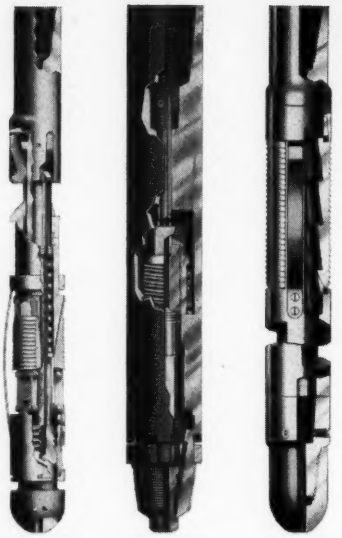

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For a binary system the relative volatility is sufficient to permit computing an equilibrium line. For a complex mixture of more than two components the equilibrium line may be constructed by using the relative volatility and making corrections for the effect of the other components present in the system. It can be appreciated therefore that the relative volatility is an important fundamental.

Relative volatility for any two components varies somewhat with temperature and pressure. As most columns are operated at substantially constant pressure, the effect of pressure drops out once the pressure is established and the relative volatilities are evaluated at this pressure. In a case of narrow boiling charge stocks where isothermal conditions are approached, the variation of relative volatility from top to bottom of the column is negligible. Where there is an appreciable temperature gradient in the tower the variation in relative volatility must be taken into account.

With reference to the effect of pressure on the relative volatility, it is a well known fact that the relative volatility for two components decreases with increasing pressure making it increasingly more difficult to separate these components by fractionation.

When considered as a separation factor, relative volatility permits making preliminary component distribution estimates between the overhead and bottoms for use in making theoretical fractionation calculations. Such estimations are necessary when it comes to setting up the initial component material balances necessary to start the calculations. The procedure followed is to plot the ratio of concentration of a component in the distillate to the concentration in the bottoms vs. the relative volatility or separation factor. From this type of plot it is possible to tell the relative distribution of the components between distillate and bottoms.

While on the subject of phase equilibrium, it is appropriate to mention latent heat of vaporization, which is an important heat quality in fractional distillation because vaporation and condensation are the means of transferring heat from stage to stage in a fractionator. Although heats of vaporization are so important to fractionation, this type of data is not at all plentiful for hydrocarbon mixtures nor is there a good method of computing heats of vaporization for mixtures. There are heat of vaporization data available for pure components and methods (92) of approximating vaporizational heats for mixtures. However, the available data and methods on

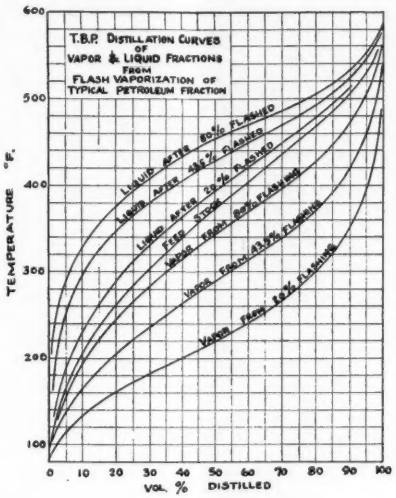


Figure 6

latent heats are not very complete. This subject needs experimental and thermodynamic attention, and the study should be made in conjunction with phase equilibria investigations, if possible.

In making heat balances on absorber, it is necessary to have heats of solution for the light hydrocarbons, such as methane and ethane, which may be absorbed at temperatures above their critical points where they could be liquefied. This presents a problem that cannot be solved without experimental data. Since these lighter hydrocarbons often occur in solutions or as liquids in very small quantities, the heats of solution or latent heats used in computing the heat balance are not of much consequence because of the minor effect on the heat balance.

Some time ago this author developed a series of total heat charts for hydrocarbons and with them proposed a method of application to hydrocarbon mixtures, with particular attention to the cases of a liquid with light components dissolved in it and of a vapor with heavy components vaporized in it. The method suggested, and justified for computing heat contents of liquids with dissolved light components, a method of computing the enthalpies of these lightest components by using the values at their extrapolated vapor pressures which is a function of temperature only. This worked satisfactorily for the heat balances made on gasoline stabilizers where the possibilities of error were small anyway.

Although these charts and this method were never published they "got around" in various ways and I have since learned that some hydrocarbon engineers use this extrapolated vapor pressure concept to estimate heats of solution of methane and ethane in making heat balances on absorbers, which is definitely not correct. More work on this subject would certainly be desirable.

(Continued in next or
1st issue of May

Oil Group Aids Red Cross

The Wildcat Committee of the Western Oil and Gas Association in a distribution of net proceeds from the 1946 benefit Christmas Jinks, held in December, has sent checks in the amount of $500.00 to each of the American Red Cross Chapters located in the following oil centers: Bakersfield, Coalinga, Los Angeles, Taft, Santa Maria, and Ventura.

During the war years the Committee dedicated the net proceeds of its annual oil industry Christmas Jinks to worthy causes, former beneficiaries being the Arts and Skills Division of the Red Cross and the Merchant Marine.

In making the current distribution, Chairman C. H. Tuttle said that as the financial success of the benefit functions has been fully dependent upon the wholehearted support of the oil companies, supply companies, and oil industry personnel throughout the State, it was decided in this instance to make contributions in oil centers in the State, the local chapters of the American Red Cross in the designated areas being named as the beneficiaries.

Our Billion-Dollar Side-Show

By H. H. ANDERSON, Vice President
Shell Pipe Line Corporation

Cathodic Protection is deemed so important that eight industry associations, the two nation-wide communications systems and a professional association recently joined their effort in a committee to inform managers about it, to promote cooperation within and between industries in applying it, and to aid the local solution of its technical problems. This work will take time. Thus, as Chairman of the Correlating Committee on Cathodic Protection, I am presuming personally to "jump the gun" with this direct appeal to management for understanding and cooperation.

When Mike Jacobs can draw a million-dollar gate at the Stadium for a one-round main event, we concede that Barnum was right. But what about us in industry who are needlessly paying billions* for a show we can't even see? I refer to soil corrosion—Nature's relentless attack on our buried pipe lines, power and communications cables, rail systems and other metal structures. And I say "needlessly" because much of the damage can be stopped by Cathodic Protection if we will appreciate and apply this simple principle disclosed by Sir Humphrey Davy in 1824!

A Speaking Acquaintance

Cathodic Protection can save industry from myriad costly service breakdowns, commodity losses, customer ill-will and plant repairs and renewals. Yet many corrosion engineers tell me that a prime limitation on its use is that Management is not yet sold on it. These ardent exponents know how simply it works, how great is its value, how tangible is its economy, and how it warrants broader acceptance. Thus I suspect many engineers have confused instead of enlightened the boss with too much detail while trying to explain facts that seem obvious to them. Believing that every operating executive owes it to his business to be at least on speaking terms with Cathodic Protection, I beg to introduce you herewith.

Dust Thou Art

Let's raise the iron curtain on this billion-dollar show. We started it ourselves when we buried our refined mental structure bare (or practically so) in the soil. This upset Mother Nature's age-old chemical balance, and the old Dame promptly started soil corrosion at work to restore it. Soil corrosion of metal is caused by a localized attack of soil chemical solutions. It starts where the soil is more moist and acid or alkaline than average, or it can start at a defect in the metal surface. It generates electric currents which flow from the point of attack out through the soil back elsewhere to the metal.

Assault and Battery

You recall that in a common battery the solution attacks the zinc or baser metal, called the "anode", to generate a current. This current flows out through the solution to the carbon, called the "cathode", thence through a metallic circuit back to the anode. And what of our buried structure? Contacted by the varying soil solutions of Nature, its bare surface serves both as anode (the area under attack) and as cathode (the rest of its surface) because its metallic continuity forms a circuit between them. As shown in Figure 1, if our structure is long (or is of large area) it can be a part of many such natural batteries, and thus it can have a series of anodic and cathodic sections.

Jekyll and Hyde

Soil moisture, that well-known H_2O, plays a dual role in our subterranean melodrama. Figure 2 shows a molecule at work! During the chemical attack some of the water divides into hydrogen and oxygen, each going its separate way. Oxygen is the one that attacks our structure. Its corrosive atoms create an anode, which responds with a weak but determined electric force that sends currents out through the soil seeking a cathode. But hydrogen rushes to the rescue. Its atoms ride the currents through the soil and cover the rest of the bare surface. Soil chemicals cannot pierce the hydrogen film, thus it shields all but the immediate area under attack; i. e., it protects the metal by forming a cathode. Eureka! There's a clue to Cathodic Protection. If we can cover **all** of the surface with enough hydrogen we may protect it completely.

The Sacrifice

And how is this to be done? As they say in the movies, we merely get a "stand-in" or a substitute anode. Through it we can apply other currents strong enough to enter our structure's entire surface via the soil, thus overpowering and reversing the local battery currents trying to leave. The simplest way to protect a **steel** or **lead** structure is to merely bury a chunk of baser metal (such as magnesium, aluminum or zinc) near the structure, and connect the two by an insulated wire. Oxygen has a greater affinity for this baser metal, so—as long as the two are connected by the wire—it instead attacks the baser metal! This responds more vigorously and forces much stronger currents out through the soil en route to our structure. As shown in Figure 3, hydrogen again rides them all and makes a cathode of its entire surface—even the areas before under attack. The

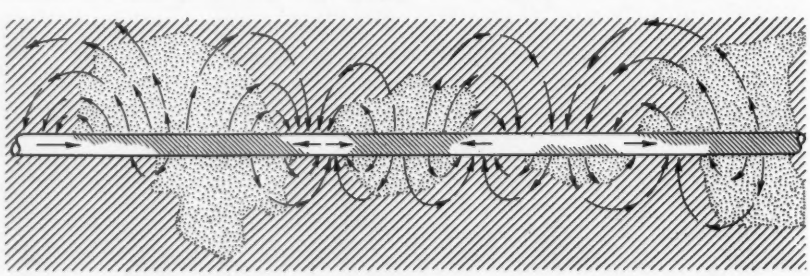
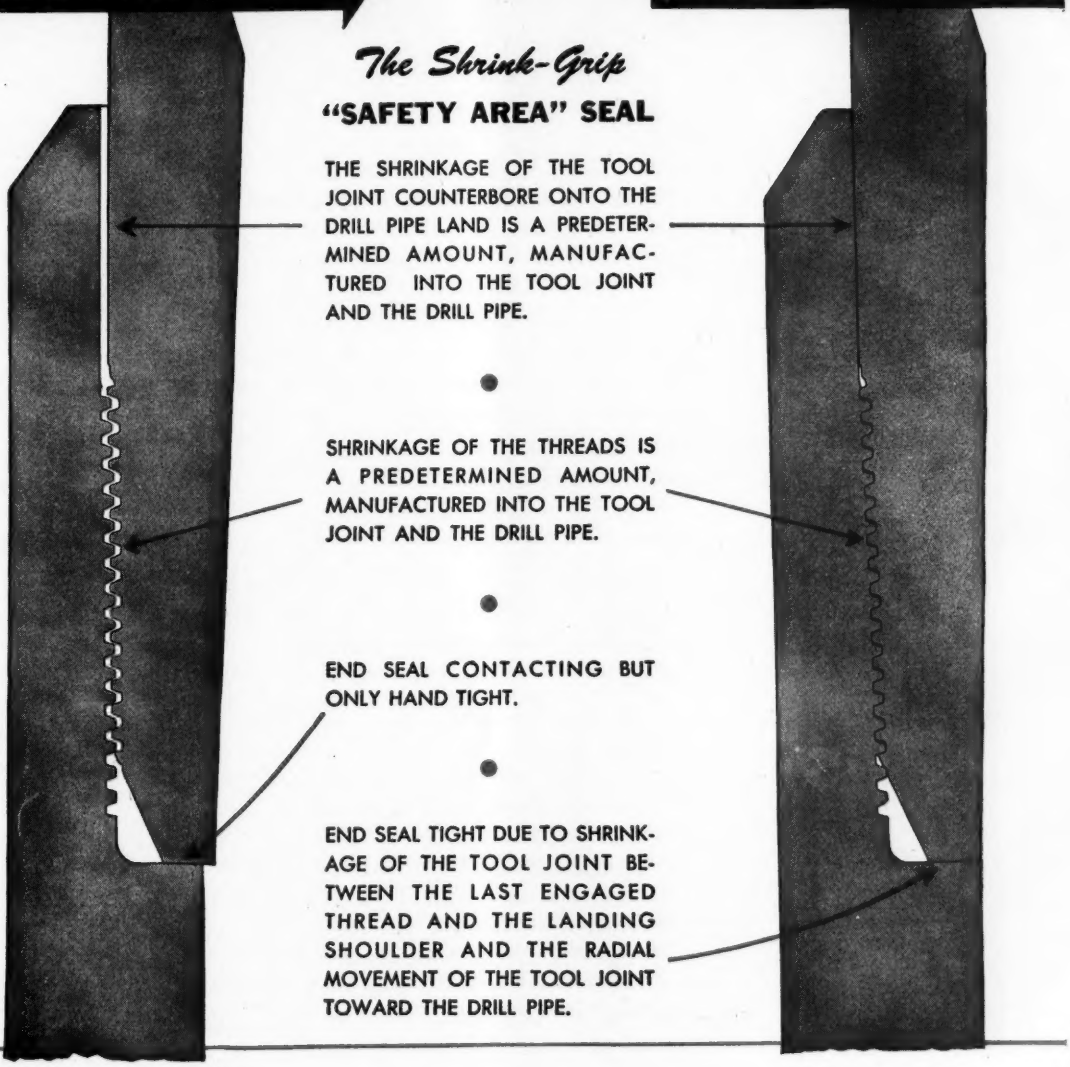


Figure 1
Series of batteries caused by attack of patches of sour or moist soils along a structure. Arrows show currents flowing from anodic areas (areas of attack) to cathodic areas.

Get these advantages that only Hand-applied REED *Super Shrink-Grip* TOOL JOINTS *can give you - for more wells per string with* GREATER SAFETY

THE TOOL JOINT IS HEATED AND SCREWED ONTO THE DRILL PIPE HAND TIGHT UNTIL IT STRIKES THE END OF THE PIPE.

COOLING AND SHRINKAGE CAUSE THE SHRINK-GRIP SEAL, END SEAL AND THREADS TO BECOME EFFECTIVE.



The Shrink-Grip "SAFETY AREA" SEAL

THE SHRINKAGE OF THE TOOL JOINT COUNTERBORE ONTO THE DRILL PIPE LAND IS A PREDETERMINED AMOUNT, MANUFACTURED INTO THE TOOL JOINT AND THE DRILL PIPE.

SHRINKAGE OF THE THREADS IS A PREDETERMINED AMOUNT, MANUFACTURED INTO THE TOOL JOINT AND THE DRILL PIPE.

END SEAL CONTACTING BUT ONLY HAND TIGHT.

END SEAL TIGHT DUE TO SHRINKAGE OF THE TOOL JOINT BETWEEN THE LAST ENGAGED THREAD AND THE LANDING SHOULDER AND THE RADIAL MOVEMENT OF THE TOOL JOINT TOWARD THE DRILL PIPE.

Reed ROLLER BIT COMPANY

HOUSTON 1, TEXAS, U. S. A.

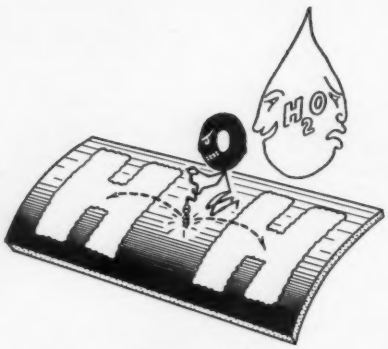


Figure 2

currents return from the structure to the baser metal anode through the wire. In the process, the baser metal instead of our structure is slowly oxidized or corroded away. Biblically speaking, it lays down its life for a friend. That's why we call it a sacrificial (or "galvanic") anode.

A Knock-Out Punch

Some soils are so corrosive as to require stronger measures. Here we may bury a mass of junk iron or steel (or a carbon rod) nearby to serve as the anode. Then with insulated wires we connect a strong external direct-current source, such as a 10-volt generator or rectifier, (+) to the junk and (—) to the structure. The generated currents force their way from the junk anode through the soil into the structure and smother it with hydrogen. The junk will be eaten away in time and must be replaced. A single such unit, being ten times more powerful than a galvanic anode, can protect several miles of structure under some conditions. The choice of a current-supply in each case poses some nice problems, not only in meeting the need but also in the balancing of first costs versus recurring expenses.

Rags and Tatters

Our buried structure can be protected also with special enamels or coatings. But only during the last few years have we learned how to apply these properly. There's many a mile (and acre) of structure with defective coatings; and these may be worse than none because such defects act to focus corrosion and localize pitting. What are we to do about them? The cold sod is a poor and expensive place in which to apply new coatings, anyhow. Thus, if our structure's present coat is tattered, Cathodic Protection may provide safety with economy.

They Hide the Body

When installing new metal structures, many shrewd operators know that a modern enamel coating, properly applied, plus **some** Cathodic Protection is best economy in the long run. They never can infallibly predict the soil action along a new route, an they know it costs about five times as much to later dig up, clean, repair and coat a line than to coat it right in the first place. They know also that a bare metal structure must be extra thick to allow for corrosion pitting, and that this extra metal costs about as much as a good coating. But even the best of coatings may develop defects (either while being buried or later); so a light supply of hydrogen should be on guard to fill the holes. Thus **some** Cathodic Protection is good insurance even on a newly-coated line.

At the Crossroads

It looks as if that should end our troubles, but no. For better or worse, every current must flow back to its source. If a neighbor's metal structure is adjacent, or if it crosses but does not touch ours, and it is within the field of the currents flowing from our protective anodes to our structures, some of the generated current may possibly "stray" into his structure (which provides a low-resistance path) and flow through it to the point nearest ours. There the current must leave his structure to pump through the soil back into ours and return to its source. We saw before that chemical attack on metal will cause current flow. Well, it also works in reverse! Where our stray current leaves his structure to enter the soil, it may cause chemical attack or local corrosion. This action is called "electrolysis".

Out Of the Pit

Electrolysis can be as bad as true soil errosion because, with either one, a current flow of one ampere in a year will destroy 20 pounds of steel or iron, or 75 pounds of lead. And both usually focus to cause pit-holes which soon pierce our structure. Electrolysis can be avoided by connecting a resistant wire or "bond" between the two structures to drain the returning stray current from the adjacent structure into the protected one. This "drainage bond" must be well-designed, however, because too little drainage will not stop the interference, while too much will give our neighbor real Cathodic Protection at our expense. We want to be friends, don't we—but not philanthropists! It was said above that a good coating reduces the current needed to cathodically protect our structure. The lesser current, in turn, reduces the chance for electrolysis to occur!

City Slickers

Strong stray currents from electric railway tracks have long caused electrolysis of other buried structures in cities. Several competent local committees have worked for years to minimize this action. However, with the steady conversion by transit companies to motor-bus and double-trolley coach service, that trouble is abating through removal of its cause. Conversely, true soil corrosion is spreadng in cities be-

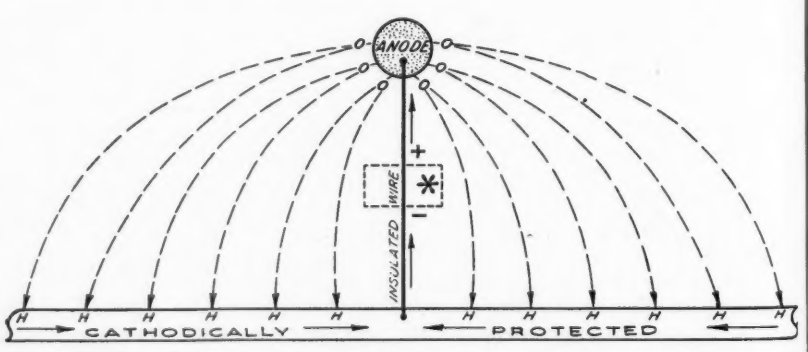


Figure 3

Long structure showing currents from buried anode entering structure. All oxygen attack is at anode. Structure is entirely protected by hydrogen.
***Generator may be placed here if galvanic anode is not used.**

DAY BY DAY IN EVERY WAY,

PIPE WIPERS

BETTER PIPE WIPERS combine the best *ideas* suggested by the drilling crews who use them and the *science* of the engineers who design them. This combination of *field practice* and *engineering skill* is the reason why Patterson-Ballagh Pipe Wipers do a superior job today!

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All of these advanced features add up to better wiping and longer wear. Critical strain develops where the center wiping web joins the rim. Here, it flexes the most under high tension as drill pipe, tool joints and Protectors run rapidly through. Here, the entire elastic strength of *solid* rubber is needed to distribute the heavy strain into the steel reinforcing ring hidden in the rim. All styles of Patterson-Ballagh Pipe Wipers have an additional thickness of pure textured rubber around the inside rim where the hardest flexing occurs.

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cause removal of the stray currents allows the weaker currents of Nature's batteries to flow unopposed. Thus city operators, too, must increase their interest in Cathodic Protection.

The Denouement

If we want to use Cathodic Protection, we can ill-afford to interfere with neighboring structures by electrolysis. Yes, and our neighbors can ill-afford to have this done. But decorum tells us that our corrosion engineers should not trespass the other structures—even to make the tests needed to design the drainage bonds. However, if our neighbors also are acquainted with the problem and will cooperate for the common good, they will welcome the tests, the technical details can be readily worked out, the bonds can be installed and all structures will be benefited.

Quintessence

Often we may want to install Cathodic Protection where a neighbor's structure parallels ours for quite a distance. Then his structure will absorb much of our precious current and need several drainage bonds merely to prevent interference. Here we often can save money by inducing him to install Cathodic Protection too. And why not, if his structure lies in the same corrosive soils? Several large companies have installed many protection units jointly. Capital as well as operating expenses are shared equitably, and with mutual satisfaction. Here, again, acquaintance with the general problem at the management level aids the engineers to work for maximum protection and economy. Such results help the customers, and please the stockholders!

Summing It Up

As the curtain drops on our show, we can take stock. Does Cathodic Protection work simply? In essence, yes; we just get a current source or anode and spray on a little hydrogen. Is its value great? Why not—if it stops the corrosion. Does it need a special kind of cooperation? It doesn't if we are all acquainted with its problems and will follow the Golden Rule. But what about its tangible economy? If you are not already sold, a good corrosion engineer probably can prescribe it for your own structures and soon convince you of its economy. But to stress my main point, you can see that cooperation with others in Cathodic Protection is good business.

They Also Serve

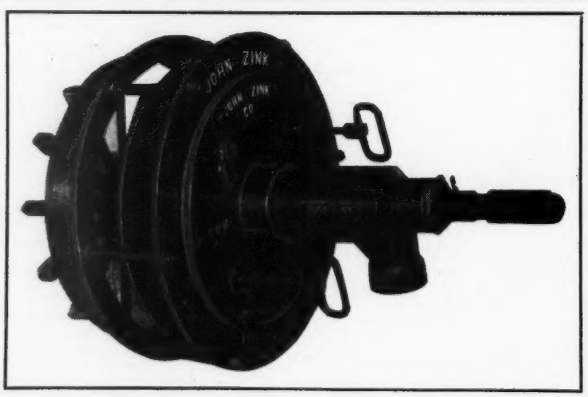
The problems of Cathodic Protection aren't really as simple as I've made them seem. Their solutions call for data, science and experience mixed with plenty of plain horsesense. But our corrosion engineers will work them out for us and thereby lessen Industry's heavy losses from soil corrosion to the extent that we afford them the opportunity and lend our sympathetic support.

---

*According to Bureau of Standards Circular C-450, the annual cost of pipe line replacements due to corrosion is approximately 200 million dollars per year! This does not take into account the costs of replacing various other types of plant suffering from soil corrosion.

JOHN ZINK
-CBM-
BI-MIX BURNER

★



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Kern County OIL NEWS

VOICES FROM KERN differed considerably in tone toward the terms of peaceful legislation in Sacramento, and toward a host of bills affecting the oil economy of the state. However, at week's end a fortnight ago some "Diogenes" of the local press presented a survey of costs that cooled off heels. (No pun intended.) Said he, "the price of Ethyl is only upped 3% in the last decade, but the price of hamburger has increased 300." **"Anyhoo"** our grocery bill used to run around $42.00 for three of us in 1936, but now it hits the jackpot $99.99 or about that much **everytime a month** goes by.

FEW SIGNS OF SPRING are left since summer was not so awfully far behind. However, it's nice to have Los Angeles and San Francisco join with Kern to help us make our weather most unusual.

NO KIND OF WEATHER on the other hand seems to decrease the pumping unit population along the Golden State Highway (U.S. 99), below the old Grapevine. We think those great long rows of units look more like jumbo grasshoppers everyday. The Chambers of Commerce want to "Walt Disney" them for Christmas as tourist lure replacing wildflowers.

THANKS TO OILMEN in this area, and a high class modern endeavor to make something happen by young men with young ideas. In an ad service **"Printer's Ink"** Kern folks were given a national nod of recognition. The B. & B. Advertising Co. and its service to oilwigs and their allied industries are mentioned.

WEDDING BELLS RANG for Fred Green of Tide Water Associated, but at this writing further details are not now readied for much publicity. First, however, Fred bought the Chrysler, then the home . . . when there was nothing else to do so he "dood it" and we are waiting his return for all the "chivaree" details.

KEN WARD of Taft, at SOCO, also gave up and let the bells of double blessedness ring him into a state of matrimony on earth.

AND SO WE MIGHT just as well keep on going, for Bill Courtright, of Tide Water, also said **"yes"** and **"I do"** all over again to no one else but Ninabel Rankio, who said in substance and substantially "me too."

HARRY A. HOPKINS, that well known and often mentioned "taxpert" is, now, and has been admitted to the closed meetings of the Kern County Board of Supervisors engrossed in setting up the preliminary budget for fiscal 1947-8. Editor's note: Good going—and the oil companies . . . should be, and are, we know, grateful for an excellent relationship of this kind. Well do the oilwigs know that many more flies are caught with smiles and sugar than with brickbats and vinegar. And the flies in the oil ointment right now are little "grims" called scientifically, "profit barriers," according to the press.

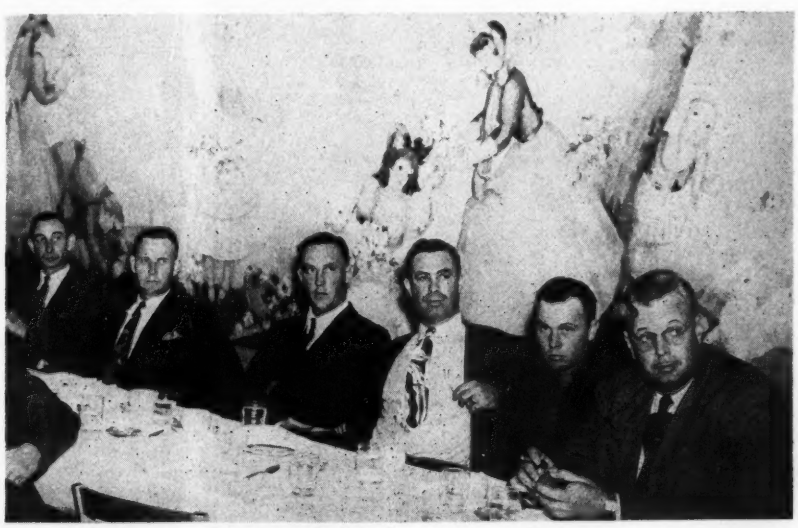
MAKING SOMETHING HAPPEN is Roy Fletcher, of Texaco, on a two weeks leave of absence with the U. S. Naval Reserves.

TO CAIRO AND THE Middle East went HARRY SPRAGUE last month, on a business mission officially blessed. From that point he cabled, "oil is well" and of course we thought so all the time, but it was oil news just the same.

SUPERIOR DOES IT. "When deeper, bigger operation tools, and better oil records are made known, Superior will do it" . . . so runs an ad in a salute to Superior Oil. Psychologically the word Superior has to make good and it does.

TENNET BROOKS whom we mentioned a long time ago as being no longer with Glenn Ferguson is making good in his new capacity and reports "okey."

AL KERR of the Ohio is a proud, proud "papa" of Laurelynn as of 4-14-47. Hospital attaches informed us today that Senior Al Kerr is recovering.



These members of the National Association of Drilling Contractors help to encourage action from the Head Table in their regular meeting at Bakersfield Inn. From left to right, Mark Fife, Tine Gaiser Drilling Co.; Bob Barnett, Gene Reid Drilling; R. N. Kellogg of K-L-K & Sons; M. J. Stansbury of his own company; Ted Gray, Tine Gaiser; and O. D. ("Tine") Gaiser, himself.

DON DAVIS the Union Scout (no pun intended here, either) is now "gossip monger" and trying to "telephone-in" his tips to the tipsters on all kinds of "knews" . . . we hope Editorially he will have more tips next come COW (California Oil World) time on second Wednesdays.

THAT LADY FROM TAFT — graciously inclined to help out in making something happen, tells folks about the importance of oilwigs and their many organizations to get things "a tickin'" . . . well, she just sent us a "nooze" item . . . she relates that **she for whom** the bells toll in matrimony was no other than Miss Christine Meany . . . (gosh we hope not) . . . and that it all happened in Merced . . . and it was on Easter Sunday. And the lucky man was Ken Ward whom we mentioned in about the sixth stanza or so as of above or before

FOR SEVERAL FORTNIGHTS NOW we have not been so sharp as our signs so indicate. For instance the funny page of "COW" has been missing from our issue . . . well, today we found them . . . all "zipped" out . . . No longer can we afford such jokes to age in our secretary's desk—she reads them first and acts as censor for the office.

CONFIDENTIALLY vice president of the SJVOPA, Fred Owen, relates a report of good oil business to Ernie Pyle the conservationist who enjoys good news as well as good stories.

DOYLE GRAVES is now with Union . . . it is just impossible these kind of times to estimate or appraise the value of a bright young man fast enough to promote him or catch up with all his opportunities.

OLD MAN JIMMY RADOUMIS, who will probably not ever see this "colyum" or tell us if anyone ever called it to his attention, has done a lot for the oil industry of this county in the past year since his return from Guam. Recently he took on the job of defending the criticism of mining people who complained that Kern minerals, the richest and most in the land, were not properly made known by exhibits. State figures show that, to the mineral returns, must be added or included . . . natural gas and oil along with cement, borax, gold, and "what have you" . . . deduct oil and the miner feels better — wants to stay with his old claim.

PAUL HUBBARD AND ASSOCIATES over on the fringe of Kern and at "Jober," want a sixth district of political subdivisions. Taxperts say valuation not adequate and present habitants on countywide level could or would not bal-

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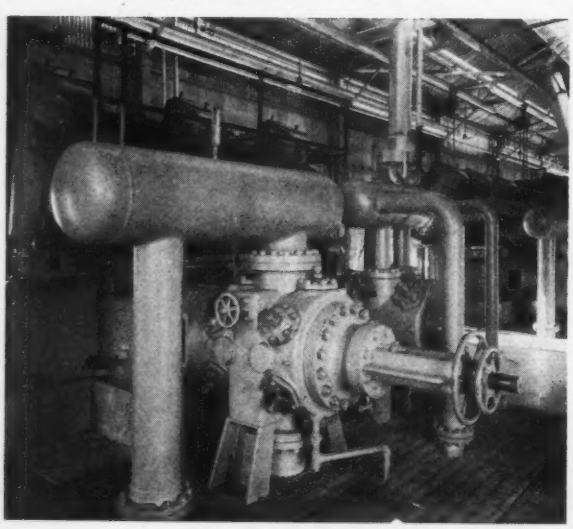

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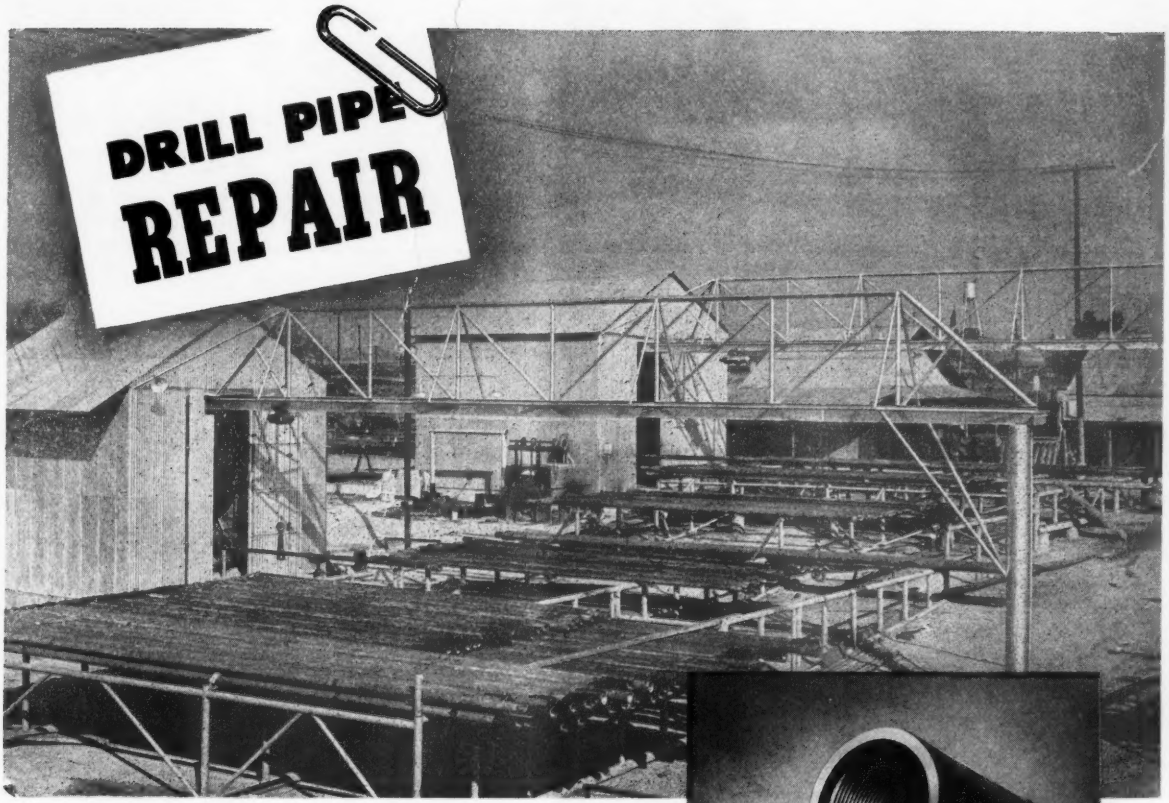
DRILL PIPE REPAIR



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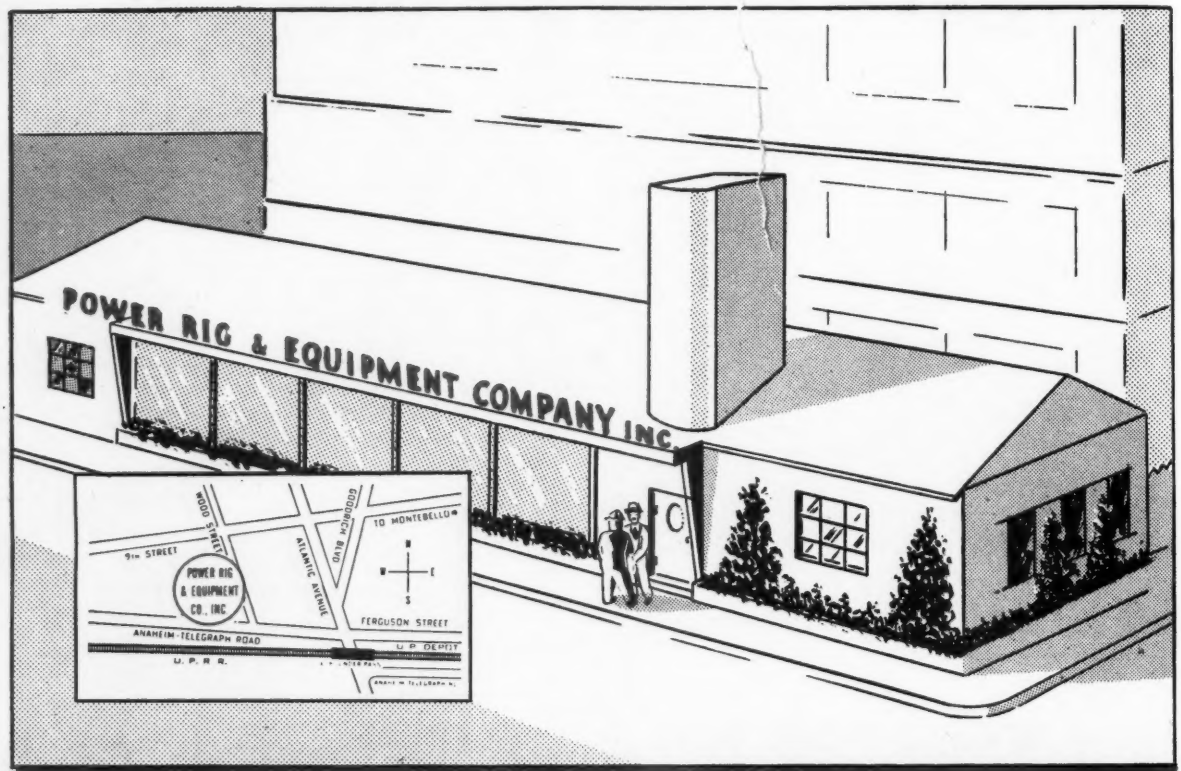

We know you will appreciate what we are doing. Expansion is necessary because of the loyalty of our many customers. Now that we have established a new and completely equipped building and selected a new name more descriptive of the services we render and the products we sell, we think you will find in *Power Rig & Equipment Company, Inc.* the same good service and spirit of cooperation that has in the past won your confidence. Our expansion is due to your faith and patronage. Thank you.

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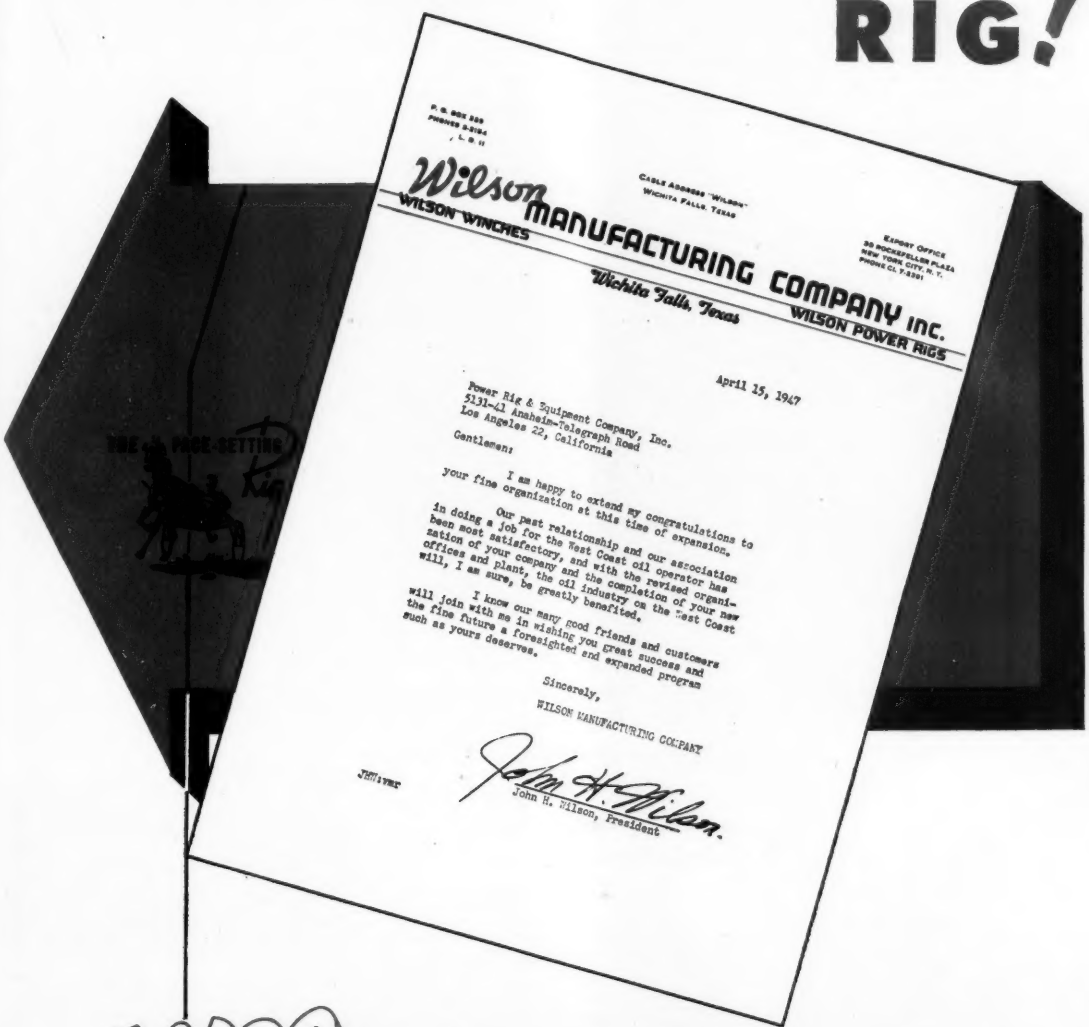
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WILSON WINCHES
Wichita Falls, Texas
WILSON POWER RIGS
April 15, 1947
Power Rig & Equipment Company, Inc.
5131-41 Anaheim-Telegraph Road
Los Angeles 22, California
Gentlemen:
I am happy to extend my congratulations to your fine organization at this time of expansion.
Our past relationship and our association in doing a job for the West Coast oil operator has been most satisfactory, and with the revised organization of your company and the completion of your new offices and plant, the oil industry on the West Coast will, I am sure, be greatly benefited.
I know our many good friends and customers will join with me in wishing you great success and the fine future a foresighted and expanded program such as yours deserves.
Sincerely,
WILSON MANUFACTURING COMPANY
John H. Wilson, President

Wilson

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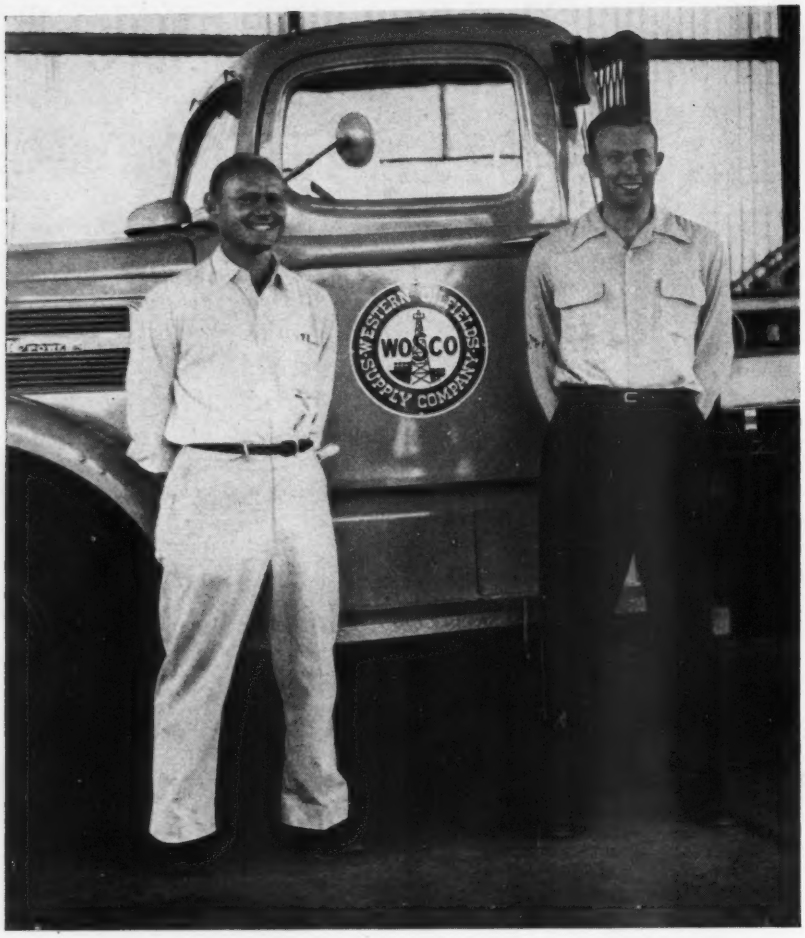


"WOSCO" ADDS TWO MORE: Western Oilfields Supply Company announced this month that it had placed WLLIAM WHITAKER (right) and DOUGLAS RAPPLEY in the sales and service department. Both men recently served in the Army Air Corps . . . they know Kern County and the way around the oilfields very well.

lot favorably. Besides, only five are allowed by law. Tennyrate folks are practicing "imagineering." So be it.

ALL MIXED UP AGAIN . . . the Campfire Girls are selling do-nuts and the JayCees have a drive . . . the girl scouts want to have cookie day . . . but what fooled us most was a note signed L. M. Lewis . . . an oil scout from out West . . . and she turned out to be a grown up lady.

WESTERN OILFIELDS SUPPLY COMPANY, just "woSco" to most of us, is making some post-war signs of things to come, and already here. Charley Lake, according to Dwight Bovey, "woSco" sales and service manager, has added two more salesmen to the staff. These well known men as Bill Whitaker and Doug Rappley, recently with the U. S. Army air corps. Both Kern County fellows who know their way around the oilfields. Incidentally, Dwight Bovey left for a tour of the country . . . to southern and mid-continent areas. Purpose of the trip . . . to buy pipe . . . all kinds and any kind . . . for manufacturing conductor pipe. However, Charley has not limited him to spending money . . . so some time will be spent studying pipe manufacturing, repair service methods of other concerns . . . and examining their "knowhow."

GEORGE TERRY of the Drilling Company by the same name is drilling ahead down Tejon way for CCMO according to his very private secretary, Mrs. George Terry. Besides keeping track of friend husband George, Mrs. Terry tries to keep an eye on and an ear toward Washington, D. C. At present she is Secretary to Mr. Roland Curran, Manager Central Valley Project Association, a special envoy this year before the 80th Congress to legislate for earmarked

WAX -

FINE IN CANDLES
A HEADACHE IN OIL LINES

Nobs Wax Solvent will dissolve and remove the most persistent waxes and paraffines from wells lines and traps.

NOBS DEHYDRATING CORPORATION

2465 East 53rd Street, Los Angeles 11, California

Wilson Bros.

PAINT ENGINEERS
CONTRACTORS

WHITTIER 43-275

FOR SALE

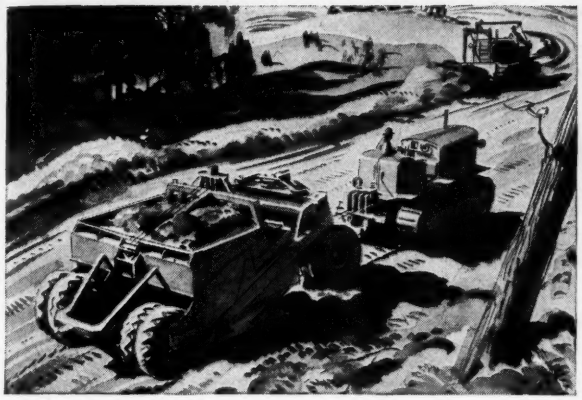
Two 125 h. p. 250# working pressure Broderick boilers Herley-Kelly, 3201 Pasadena Ave., Long Beach 7, Calif. Phone Long Beach 425-23. tf

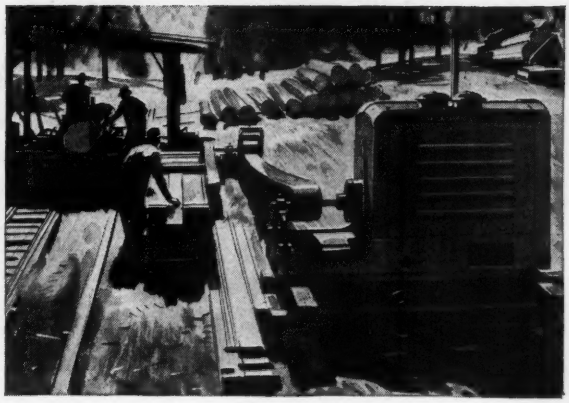
FIELD GEOLOGIST

Foreign, areal mapping, mainly reconnaissance but also indicated detail surveys. Approximately 5 years experience. Minimum salary $6000 plus allowances. Write to The Atlantic Refining Co., Rm. 900, Box 7258, Philadelphia 1, Pa. 5/5b

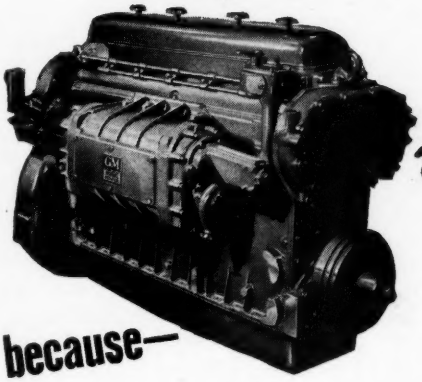
SEISMOGRAPH SUPERVISOR

Eastern Venezuela. Party chief experience, to act as Company representative overseeing labor, technical and operating phases of contract party work. Minimum salary $6000 plus living allowances. Foreign experience and Spanish helpful. Write The Atlantic Refining Co., Box 7258, Philadelphia 1, Pa. 5/5b

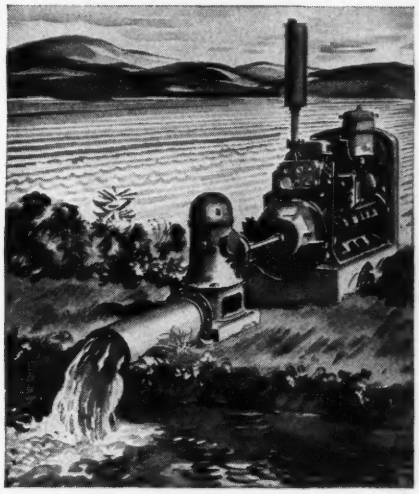




Bring on the hard work



Here's the Engine for it!



because—

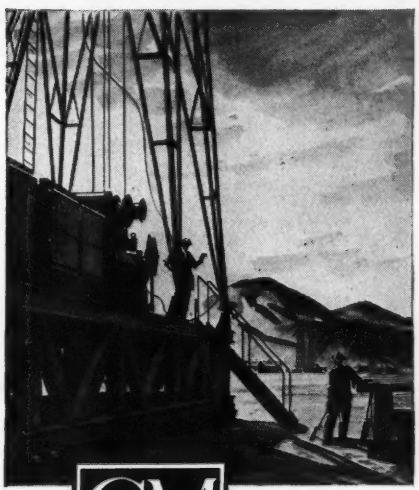
there's power at every downstroke

No matter where a General Motors Diesel engine goes to work, you can count on a smooth, steady flow of power. Because each piston downstroke is a power stroke, there are twice the number of power impulses for each turn of the shaft. A "six" is as smooth as a "twelve" in an ordinary engine.

Besides there's better acceleration under a load—and starting's quicker.

So it's easy to see why GM Diesels are "naturals" wherever a steady, sturdy, smooth source of power is required—why they are top-notch for lumbering, fishing, construction, well drilling and for every job where tough, compact, dependable power is needed.

So, no matter what your requirements might be, if you want sturdy, money-making, safe power, be sure to look into General Motors Diesel engines.



DETROIT DIESEL ENGINE DIVISION

DETROIT 23, MICH. • { SINGLE ENGINES . . *Up to 200 H.P.* / MULTIPLE UNITS . . *Up to 800 H.P.*

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GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

GENERAL MOTORS CORPORATION

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ANDERSON-O'BRIEN COMPANY

GENERAL MOTORS DIESEL ENGINES

Our stock of GM Diesels assures you of the right engine for the job—plus fast delivery.

And, as our customers are learning, our interest does not end with your purchase.

Your investment is guaranteed by our Service Department. This group of Diesel experts get out in the field and make sure that every GM Diesel installation in our territory is properly set up and functioning efficiently.

From Anderson-O'Brien, too, you can look for engineering help in the design of oil field equipment. Recent work along this line has developed special unitized drives within road clearance.

Our Technical Sales Department will be glad to discuss with you any questions which you may have regarding special equipment design or the redesign of existing equipment for more efficient operation.

ANDERSON-O'BRIEN COMPANY

746 East Washington Boulevard
Los Angeles 21, California

Telephone: PRospect 2039

funds to finish construction of Kern Friant Canal.

DAVE DAVIDSON of D&G Oil Company, Jas. M. Conlin, of Baroid; A. H. Holden of Loffland Bros., and Harvey Kerkovitz represent a mixed foresome at the "oil-zone" in El Tejon quite frequently.

J. A. WALKER of Petroleum Rectifying Co., (Petreco), and his jolly good better half, are friendly enough and sufficiently human to have interest in finding out how the other half of the world lives . . . in around El Tejon.

ONE OF THE PROUDEST RECORDS of achievement was recorded the other night at the API meeting when a popular well known head barman revealed that the stuff was made to sell and that he is celebrating his ninth anniversary as a teetotaler.

ROBERT L. ROSE (engineer), Drilling and Exploration Company, put in a good word for Kern County and gave us the pitch on some of the people around here that we always had an idea were right kind of folks. Bob's pitch proved it up.

"CHUCK" BALL . . . how he hates that word, but never bats an eye . . . he was a Senior and we were a Junior . . . we never had anything in common at Greeley High but found ourselves when he talked about potatoes, and we mentioned his firm, Hillman-Kelley and C. R. (Chuck) Ball.

NOT SOON BUT YETT . . . Norman Yett of Emsco . . . we met him and took him in at the Inn, where there was plenty of room, unlike it was 2000 years ago . . . we talked of "cabbages and kings."

ONE OF THE MOST INTERESTING CHAPS we met was William Randall K. Scott of Jones and Laughlin Steel . . . he came up here from Los Angeles to get away from the climate and found Kern ideal . . . with no apologies for the weather. He claims that while recently in Texas he heard no apologies for some awful weather . . . and that is what he likes about that part of the South. Not the weather but the absence of it as regards talk.

OF WESTERN GULF came T. H. Tony Wallace . . . interested in production . . . to visit folks and exchange ideas. GP's Doug Kingman is production "super chief" and he and all the rest of us held old home week and let out good ideas here and there . . . and those who had it, let down hair . . . to solve the cockeyed troubles of the world.

"OFF BRANDS" IN OIL BURNERS are available now according to Wall Street Journal. It seems the seller's market waned as

In Kern County at Bakersfield drilling contractors (left to right): E. E. Whipple, San Joaquin Drilling; H. C. Cowan, H. S. Tenny Drilling Co.; W. R. Lewis, National Derrick News; C. L. Fowler, Fowler Drilling Co.; Tracy Harkness, Tracy Harkness Drilling Company; J. E. Pettijohn, H. S. Tenny Company; Roy Gutherie, Tracy Harkness Drilling Company; C. W. Grother, Fowler Drilling Co.; L. A. Miller, Miller & York Co., F. A. York, Miller & York Co.; W. D. Wiley, L & L Oil Co.; H. W. Thompson, L & L Oil Company.

popular makes caught up to demand. Salesmen hit trail as output in 1947 may hit a million. By June, Maurice L. Farrel of WSJ, predicts oil burner salesmen may be ringing doorbells.

OWEN JOHNSON must have gone fishing and left his valve motor running as news about him is tight. He only lives across the street from us and all the valves seemed to have had kids over there recently . . . judging from all shapes and sizes. Owen is cutting in a south door entrance and it improves the place immensely. Here again Johnson Valves display ad takes on the appearance of new modern design and is in keeping with the slicker city ads that fill the leading national mags with trade display endeavors.

PLANS TO DIVE THE TRAFFIC under Garces Circle were released this month by E. T. Scott, Division Engineer for the Highway Department at Fresno. The loss from cargo overturned would easily have paid for most any kind of new design or improvement, according to some slide rule expert who shared our space on S.P.'s "red and yellow streamer" liner.

AMORE GALLOWAY, Kern high score public speaker at Toastmasters Club International, has recently been entertaining his friends from the middle west who came out here to thaw out chillblains.

THIS REMINDS US that many tourists as well as residents enjoy the sight near Tehachapi above Walong Loop . . . made famous by pioneer railroad construction. Most of us in California have travelled over it but many of us do not realize it is really an outstanding piece of engineering and that it ranks near the top of the list for wonders of such tourists lore.

EXCITEMENT RUNS HIGH in Kern over the Oxnard plain gas and oilfield potential discovery. From Kern's capital which is halfway between Mt. Whitney and Ventura the distance is about 100 airline miles. Kern's port is now almost at Hueneme if judged as the old crow flies.

KERN COUNTY BANK makes the news again this month in order to admit a correction. Last month's gossip should have read "twice as big as the home office at Taft." Incidentally, a bank in Los Angeles which has a snazzy display in the local papers there, uses a similar art design layout and that makes us feel important . . . since we gave B&B ADV. such a blowup over "Printer's Ink" mention.

Johnston Stainless Welding Rods

PROVEN QUALITY SINCE 1931

•

A. P. JOHNSTON

1845 E. 57th St. - Los Angeles 11, Calif.

NOT LONG AGO we saw Monte Sissley of Oceanic Oil fumbling with a nickle, a telephone booth and a number of a brokerage concerns here. We found out that at ten p.m. Monte buys instead of sells. We used to have Globeville Petroleum, Ltd., work on us the same way.

EVERYTIME WE TRY TO

Resting their case—This side of the table at the Normandy Room in Bakersfield Inn, was active in presenting most of the problems of the evening of business before the A.A.O.W.D.C. including the invitation to the "National" . . . Awaiting Kellogg's gavel from head table are left to right, Ralph Marshall, Drilling & Exploration Company; F. L. Shepherd, Shepherd and Robertson Drilling Company; Jerome T. O'Brien, Shamrock Drilling Company; Dave Davidson, D & C Drilling Company; Hal Haney, Pike Drilling Company; and E. E. Whipple, San Joaquin Drilling Company.

break Art Finch in to print with an editorial he gets as cagey as a beaver in fly time. If we want to mention National we have to promise not to quote . . . it's alright to say "Jean Philipp," however.

API's met at the Inn the other night and we met a lot of folks we used to know better and some we used to know, period. Robert W. Fowler, petroleum engineer, was one. Think he is an UCLAN . . . pretty sure Arch Brunsberg is.

WHEN CHARLEY MANLEY of Oilfields Construction moved back on "99" he took his chicken coop with him, his Tiny's Ranch, bill board and all. Ever notice it? Charley is always doing something and we often wonder why Bob Ripley doesn't have this story . . . the way he advertised Tiny's Restaurant against highway rules on billboard setbacks and Kern County ordinance by its planning commission which promulgated race suicide on bill board population.

SPEAKING OF TINY'S, the place down at the old Ice Follies, Lockheed war plane plant and now Melody Bowl, on Golden State Highway (U.S. 99), this place at the annual meeting of potato growers association (most of the boys had oil wells, too) held 755 persons who were catered by Keith Manley, his excellent, efficient staff, and hostess Fay Stanley. Page the oil industry's convention because Charley Manley thinks they could feed that 1500 coming out in the summer for Long Beach all week where they might spend a day here.

SOME OF THE OILWIGS attended the Kern County Chapter of the Bruin Club this month and offered to farm out some new prospects for the grid as ruffnecks.

WE WERE REVIEWING some of the sins of the past in conservation with the API's San Joaquin Chapter which alternates its meetings between here and Taft. One thing led to another and the "over production" boys are pretty busy down at a new area between Edison and Arvin.

DRILLING RACKS which we predicted would be more empty, have had turnover pains and it seems that before we can mention it the rack that was in is out. Production is going up though and out of proportion to domestic needs.

WALTER STOKESBARY'S green and buff job in Skyline on North Inyokern Street has all the modern home appointments that make the home stand out like his firm's name, "Shell." Quite a history to the place which he built himself from use of cement and steel . . . Panel heating and cooling . . . these excite the imagination and give a glimpse of things to come.

Improved Technique Facilitates Gravel Packing Operations

(*Continuer from Page 5*)

bentonite and water used as the circulating fluid. Since the introduction of organic colloids for mud control, a number of wells have been gravel packed with mud treated with this admixture after the waterbase mud was prepared with lime. It was found that mud so treated did not gel up and therefore did not tend to stay in the gravel pack when the wells were put on production. Because the mud had a very low water loss, it protected the sand from the adverse effects of infiltration of water from the fluid, the filter cake being very thin. After these wells were gravel packed, they were not bailed but were put directly on the pump and the mud pumped from the hole. They were not washed and came in with oil in about six hours. The perforations were not blanked off during the packing operations.

Cementing Gravel Packed Wells

New developments in gravel packing procedure include the shutting off of intermediate waters by cement. This can be accomplished by gun perforating or placing a cementing collar at the desired points and forcing out cement by means of a cement retainer or squeeze-cementing tool. The gravel does not appear to be disturbed by the passage of cement through it; but insurance against gravel movement where large volumes of cement must be used can be obtained by installing circulating passages in hangers or adapters to permit the circulation of fluid without allowing the gravel to move. It is believed that the irregular passages through the gravel compel the slurry to distribute itself throughout the gravel-packed annulus.

In some cases, particularly in redrilling operations, it may be desirable to land a long section of liner and to cement at both the top of the producing zone and the lap in the water string. The lower job is performed as described above. To cement at the lap of the liner in the casing, a cementing tool with double packer is used. One packer is set in the liner and the other in the casing, with provision made for passage of the slurry out into the annulus between the two pipes.

Frank Creasey, Bakersfield contractor, is in charge of deepening and testing Guaranty Sales, Inc., F. S. & D. No. 3 corehole in the Pyramid Hills, Kings County.

Tracy Harkness Drilling is the contractor for Hancock Oil on its schist test on the Di Giorgio Rancho near the Mountain View field.

Crissman Drilling has the contract for drilling O'Melia Oil's Pellissier No. 9 at Whittier Heights.

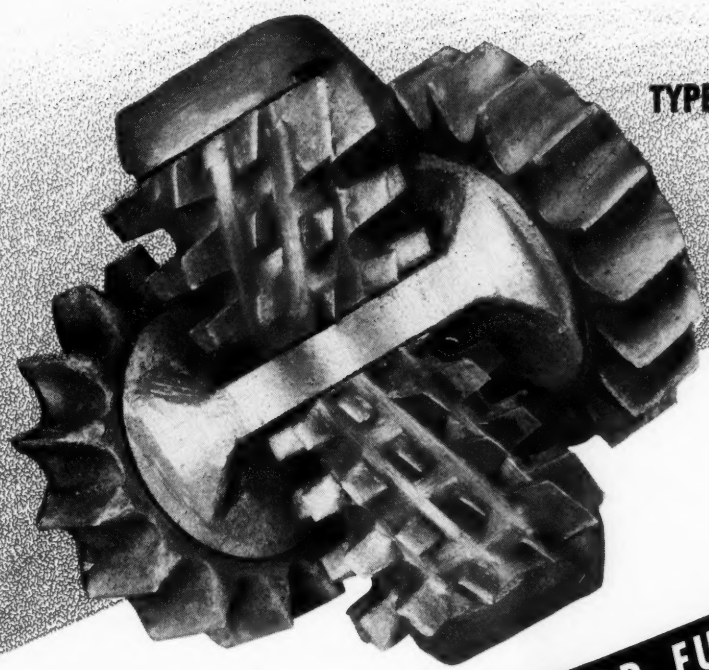
Calumet Gold Mines has programmed 30 wells for its property in the townlot area of Huntington Beach. Gene Reid Drilling is the contractor and is ready to start work on No. 1 well.

Shepard & Robertson recently scored a new well for Union Oil in the Cymric field. It went to 2410 ft. for a restricted flow of 165 barrels.

Fowler Drilling has been awarded contract for deepening M. T. Grubb, Operator, No. 1 well on Snowball Mountain, Ventura County. Present depth is 5292 ft.

Bell & Burden's recent jobs included drilling wells for Continental Oil in the San Miguelito field.

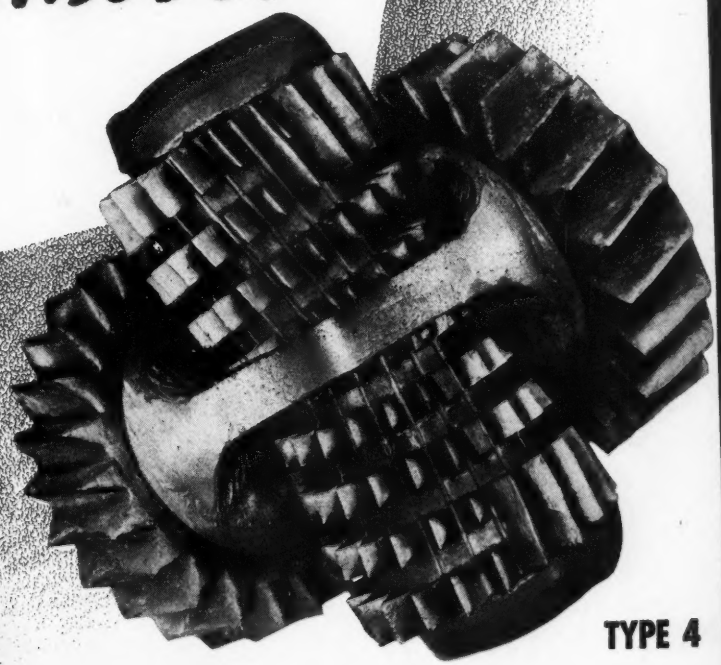
Santa Fe Drilling, contractor on Union Oil's deep test at Dominguez, has finished Union's Naranjal No. 19 at Brea.



TYPE K-2

FASTER, STRAIGHTER FULL GAUGE HOLE

More WITH H.C. SMITH ROCK BITS



TYPE 4

H C Smith Oil Tool Co.

GENERAL OFFICES AND PLANT

P. O. BOX 431, COMPTON, CALIF.

Personalities IN THE NEWS

Kirkbride Joins Houdry As Director of Laboratories

C. G. Kirkbride, prominent in engineering circles and former professor of chemical engineering at Texas A & M College, has joined Houdry Process Corporation as Director of the Houdry Laboratories, Arthur V. Danner, Houdry executive vice-president has announced.

Mr. Kirkbride will make his headquarters at the modern Houdry laboratories where more than three hundred and fifty research people are employed in the eight research buildings erected on seven acres of land near Marcus Hook, Pa.

C. G. Kirkbride

Mr. Kirkbride taught chemical engineering at Texas A & M for two years after having served as Chief of Chemical Engineering Development for Magnolia Petroleum Company at its Dallas Research Laboratories. His long experience in the oil industry includes positions as assistant director of research for Pan American Refining Company and as research engineer with Standard Oil Company of Indiana.

The new Director of Houdry Laboratories is chairman of the Program Committee for the American Institute of Chemical Engineers and is a Director of the AIChE, serving on a number of other important Institute committees.

"Kirk", as he is known in industry, was among those scientists who traveled to Bikini Atoll as scientific observers during the joint Army and Navy atomic tests at "Operation Crossroads" in 1946.

He is author of many technical papers and of the book "Chemical Engineering Fundamentals" soon to be published by McGraw-Hill Book Company.

The Director of Houdry Laboratories is 40 years of age. Born in Tyrone, Oklahoma, he is married and is the father of one son. He took his undergraduate and post-graduate work in chemical engineering at the University of Michigan.

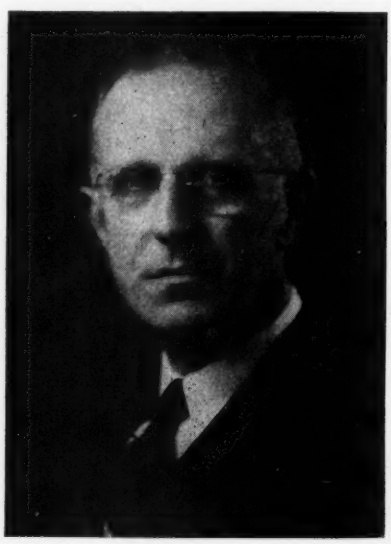
Garth L. Young, Chief Engineer, was recently elected Vice-President of the Signal Oil and Gas Company. Mr. Young has for sometime been a Vice-President and Director of Signal Oil Company, the company's marketing subsidy, but now serves as Vice-President and Director of the parent company as well.

"Geology of Los Sauces, Rincon Creek Area" was discussed by Lowell E. Redwine, Honolulu Oil, and "Ditch Sampling Technique as Related to Mid-Continent Geology" by W. D. Lewis, General Petroleum, at the geological forum, Pacific Coast section, American Association of Petroleum Geologists, at the Pasadena California Institute of Technology. John Hurndall, consultant, spoke on "Observations in Manchuria." "The World Oil Situation" was discussed by A. A. (Duke) Curtice, Curtice & Ruby.

Union Oil Company Announces Executive Changes

Harold W. Sanders, Secretary and Treasurer of Union Oil Company of California, was elected Vice President and Treasurer at the annual organization meeting of the Board of Directors.

Mr. Sanders became associated with Union Oil in 1926 and was elected an Assistant Treasurer in 1934. He became Treasurer of the Company in 1939 and in 1942, was elected to the Board of Directors and the Executive Committee. Mr.



H. W. Sanders

Sanders was also made Secretary of the Company in 1945.

Prior to 1916 Mr. Sanders served as Assistant to the President of a utility chain in the Rocky Mountain district. Following his return from a year and a half in France and England during the first World War, Mr. Sanders became interested in the grain and livestock business in Oklahoma where he became President and Director of the Citi-

zens State Bank of Minco, Oklahoma.

R. F. Niven was elected Secretary of the Company, and Irving J. Hancock was elected Comptroller.

Also it was announced that Milton G. Karr has retired after thirty seven years of service with the Company.

Grizzle Appointed Representative for Petro-Chem

Petro-Chem Development Company, Inc., has announced the appointment of M. A. Grizzle as its Pacific Coast Sales Representative, for their line of furnaces, heaters, reboilers, superheaters, and other direct fired equipment; designed specifically for the petroleum and chemical industries. M. A. Grizzle has been connected with the sale of Petro-Chem furnaces and heaters in this territory since 1942. First, for the account of Bethlehem Supply Company who still hold the Petro-Chem Development Company sales representation in the mid-continent, gulf coast and Rocky Mountain territories.

M. A. Grizzle

More recently M. A. Grizzle was associated with the Petroleum Equipment Company now Bethlehem Supply Company of California, who, during that time, were sales representatives for Petro-Chem Development Company on the Pacific Coast.

As a petroleum engineer, Mr. Grizzle has an extensive background within the petroleum industry, and worldwide field experience.

As Pacific Coast Sales Representative, Mr. Grizzle is devoting his full time to the sale of these furnaces, and has offices in the Petroleum Building, at 714 West Olympic Blvd., Los Angeles, Calif.

Mary E. Urbain, manager of the mail room in Shell Oil's Los Angeles office, has retired. Trained as a bookkeeper, she joined the company in August, 1926, as a bookkeeping machine operator in the old Southern Division. She was appointed manager of the mail room in 1929, a position she held until retirement. She was born in Pittsburgh, Pa., and moved with her family to California in 1920.

George F. Prussing, technical secretary for the Western Oil and Gas Association, was guest speaker at the recent meeting of the San Diego Firemen's Association held at La Mesa. His topic was "Fires in Small Oil Plants."

Russ Havenstrite is back at his office in the Signal Oil building, Los Angeles, after undergoing treatment for several days at the Hollywood Hospital for a minor touch of flu.

One of the California petroleum industry's busiest members is John W. Hancock, son of the founder of Hancock Oil Co. and vice president in charge of production and assistant to the president of the growing production and refining organization.

He also is vice president and director of the Southwest Exploration Co., director of the Long Beach Oil Development Co., director of the Independent Petroleum Association of America, president of the California Petroleum Safety Board, Inc., and a member of the Conservation Committee of California Oil Producers. He is well known for his work in heading many Community Chest, War Chest, Red Cross and USO drives in the Long Beach area. In addition he is vice president and director of the Long Beach Community Chest, director of the Family Service Association, director of the Long Beach Chamber of Commerce, and member of the Rotary Club.

Among passengers fortunately unhurt in the derailment near Raton, N. M., of the Super Chief were Reese H. Taylor, president of Union Oil of California, Mrs. Taylor and little daughter, Margaret Elizabeth.

Ernest Stauffen, a Union Oil director and a leading New York banker, suffered a broken arm in the wreck.

The Taylors continued their trip eastward by airliner.

Norris Heads West Coast Sales for Kerotest

Kerotest Manufacturing Company of Pittsburgh, Pennsylvania, prominent manufacturers of cast steel and brass valves and fittings, announce the appointment of Mr. James A. Norris as West Coast Division Sales Manager and the opening of new Division offices at 315 West Ninth Street, Los Angeles 15, California.

James A. Norris

Kerotest Manufacturing Company formerly occupied offices at 3305 East Slauson Avenue, Los Angeles 22, California. Warehouse stocks of valves and fittings will be carried for West Coast distribution. Mr. Joseph A. Swaton and Mr. John H. Mueller will continue as West Coast field representatives.

A. E. Collins, Manager Purchasing and Stores, Shell Oil Co., Los Angeles, being presented 35 year service emblem pin with three diamonds by S. F. Bowlby, Vice President, Los Angeles.

Frank Morgan, vice president in charge of production for Richfield Oil, has arrived at Sydney, Australia, on a geological jaunt which will include studies of ground both in Australia and Papua. Pete Hall has been added to the scouting staff at Richfield's Los Angeles headquarters. He replaces Al Sims, recently resigned.

Appointment of William Wrath as assistant to Ross Nichols, general superintendent and geologist for Bolsa Chica Oil Corp., has been announced. Wrath formerly was geologist for British-American Oil Producing at Los Angeles. Earlier he was with The Texas Co.

Mary Deedee and Margaret Leedee are the names given to the beautiful twin girls that were recently born to Carl J. McGowan, General Petroleum, and Mrs. McGowan. The twins each weigh 5 lbs. 2 oz.

BOWEN DIE COLLARS AND TAPS

ENGINEERED TO SIMPLIFY DRILL PIPE RECOVERY—

Catch and thread on hardest pipe

Hold with a full, deep grip

Withstand severest strains

Bowen Die Collars and Taps are engineered to give you every advantage in fishing for drill pipe. They are accurately machined to catch specific sizes and their slight taper takes a long, deep grip that easily holds under heavy pulling strains. The cutting edges are carburized to extreme hardness and fluted to insure smooth, deep threading on the hardest alloy pipe. Manufactured from forged steel and scientifically heat treated, these tools are tough enough to stand the severest torque and pull and are so ductile they will bend instead of break even on a crooked pull.

Bowen Taps and Die Collars are furnished in overlapping size ranges to fit any pipe or hole diameter with either right or left hand thread. The Die Collars are available with either lipped, plain, or sawtooth bottom ends and skirts and guides of any dimension are available in lip and sawtooth types. Water tight threads are obtainable when it is necessary to circulate under pressure or spot oil.

Call your nearest Bowen Service Store for full information.

BOWEN FISHING TOOL COMPANY

SANTA FE SPRINGS, CALIFORNIA
VENTURA • BAKERSFIELD • AVENAL • SANTA MARIA
CASPER, WYOMING
Export: T. E. BOWEN CO., 30 ROCKEFELLER PLAZA, NEW YORK, N. Y.

Baroid Products

TODAY MAY STOP DRILLING TROUBLES TOMORROW

- ANHYDROX
- AQUAGEL
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- BAROCO
- BAROID
- FIBERTEX
- JELFLAKE
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- SMENTOX
- STABILITE
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- TESTING EQUIPMENT
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BAROID SALES OFFICES: LOS ANGELES 12, TULSA 3, HOUSTON 2

Field Development

PREPARED FROM CALIFORNIA OIL WORLD NEWS SERVICE

Los Angeles Basin

Slant Drilled Well Producing

Continental Southern Corp. has brought to successful completion No. 113 well pumping 336 barrels daily as the most easterly producer in its Long Beach sub-city development campaign.

The project drilled from the west bank of the flood control channel at Wilmington. Hole is bottomed at 5650 ft. in sub-surface location south of Fourth street and east of Pacific avenue in the heart of Long Beach three-quarters of a mile east of the surface site. This apparently is something of a record for a slant drilled job.

Casing is cemented at 4720 ft., with 930 ft. of hole open to oil sand. No. 114 well, also destined to travel to beds underlying the City, is ready to drill ahead after cementing conductor pipe.

Del Valle Well Drills

R. E. Havenstrite, Operator., Lincoln No. 15 deep test in Del Valle field is making steady progress below 10,200 ft. Some oil sand was picked up higher, but was not the subject of complete analysis or examination.

Canoga Park Plans New Try

Vincent P. Stabeck is ready to undertake another test of the Canoga Park area, Los Angeles County. With this in mind he has staked location for Knapp No. 3 in Sec. 4-1n-17w.

Dominguez Job Tests

Union Oil is testing and squeezing for water shut off with its Hellman No. 58 in Sec. 27-3s-13w in the Dominguez area. Total depth is 11,330 ft.

Chino Area Well Squeezes

Having run water witch and located casing split near 3025 ft., Grayco Oil Co. is squeezing its Mahla No. 1 test in Sec. 13-3s-8w near Chino, San Bernardino County. Total depth is 4251 ft., with plug at 4130 ft.

Oceanside Try Drills

On the Sonja Henie Estate near Oceanside, Snell Drilling Co. is drilling its prospect job in hard shell at 2600 ft. Location is in Sec. 29-11s-4w, San Diego County.

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Los Angeles Well Flowing

Richfield Oil's new well in the East Los Angeles area, U. P. Unit No. 4 in Sec. 16-2s-12w, at last reports was flowing 666 barrels of 34.8 gravity oil, cutting 14 per cent. The bean has been fluctuating from 22 to to 40/64-in. The project established its source in two zones-8570 and 8590 ft. and 8255 and 8385 ft.

Edison No. 2 in the section is rigging derrick to start the drill.

Aliso Canyon Adds Producer

Tide Water Associated has completed Porter No. 38 in the Aliso Canyon field flowing initially 725 barrels of net 21.4 gravity oil and 182,000 cubic feet of gas daily from 8736 ft.

Whittier Job Moves Ahead

Foundation is in for O'Melia Oil Co.'s Pellissier No. 9 in Sec. 17-2s-11w in the Whittier Heights area.

Aliso Canyon Scores Producer

Tide Water Associated has added another new well in the Aliso Canyon field. It is Porter No. 28 in Sec. 28-3n-16w, which came in from 8736 ft. for a flow of 725 barrels of oil and 182,000 cubic ft. of gas.

Loma Verde Test Rigging

On a substantial lease block in the Loma Verde area near the Oak Canyon field, Shell Oil is rigging to start the drill in its USL No. 515-29 in Sec. 29-5n-17w.

Inglewood Job Reams

Having recovered fish, Basin Oil Co. is reaming its City of Inglewood No. 1 in Sec. 28-2s-14w in the Inglewood area, with hole bottomed at 6876 ft.

El Segundo Oil Hunt Fails

Standard of California has relegated to history its Six Co.'s Fee No. 3 in Sec. 2-3s-15w northwest of El Segundo. The try went to a total depth of 7274 ft. in schist conglomerate. Formation test off bottom recovered mostly mud and salt water.

Long Beach Test Deeper

Shell Oil's Dolley No. 2, a deep test in Sec. 29-4s-12w in the Long Beach field, is digging on down at 9136 ft. Elsewhere in the field, Jergins Oil Co. has spudded No. 30 in Sec. 19. Richfield Oil recently finished Denni No. 12 in the section at 3580 ft. for a yield of 70 barrels daily.

Inglewood Well Resumes Drilling

Ronald C. Smith and Macco Corp. have resumed drilling with Smith No. 10 well in Sec. 7-2s-14w in the northwest sector of the Inglewood field in Baldwin Hills. Present depth is 7000 ft. Upon completion, other jobs are planned for the area.

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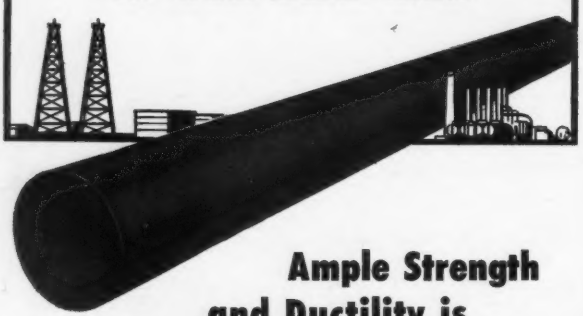

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Leffingwell Try Reaming

Standard of California's German Comm. No. 1 wildcat in Sec. 11-3s-11w in the Leffingwell area is reaming, with bottom of the hole at 7748 ft. The company's Boobier No. 1 in Sec. 15-4n-17w northeast of the Del Valle field is redrilling at 4430 ft., after going originally to 6501 ft.

Alondra Park Scores New Well

British-American Oil Producing added new luster to the Alondra Park area when it completed Bodger No. 3 in Sec. 22-3s-14w in the Alondra Park area for a yield reported at more than 1000 barrels a day. Total depth is 9145 ft., with casing set at 9100 ft. H. E. Christie, meantime, is grading for Johnson No. 1 in the section near Compton and Cerise Sts.

West Newport Try Rigging Up

Amerada Petroleum is rigging up for Holtz No. 45-7 in Sec. 7-6s-10w in the West Newport area. Anaheim Sugar No. 73-7 in the section is rigging pump, after swabbing clean oil from a total depth of 5550 ft.

Beach City Adds Interest

Calumet Gold Mines Co. is ready to start on a drilling program calling for 30 shallow wells to the Tar Sand zone in the townlot area of the Huntington Beach field. The initial job is situated 90 ft. north and 80 ft. east from the c/l of 19th St. and Olive Ave. Louis Chappuis, prominent Los Angeles geologist, will supervise engineering phase of the campaign. H. S. Dumke and Zeb A. Terry were in charge of leasing activities.

Orange County Tests Drilling

Near Corona Del Mar, Morton & Sons is drilling hard sand and shale at 6500 ft. with Irvine No. 55-1 test in Sec. 25-6s-10w, Orange County. Irvine No. 174-1 in Sec. 10-6s-8w in the El Toro area is digging at 1190 ft.

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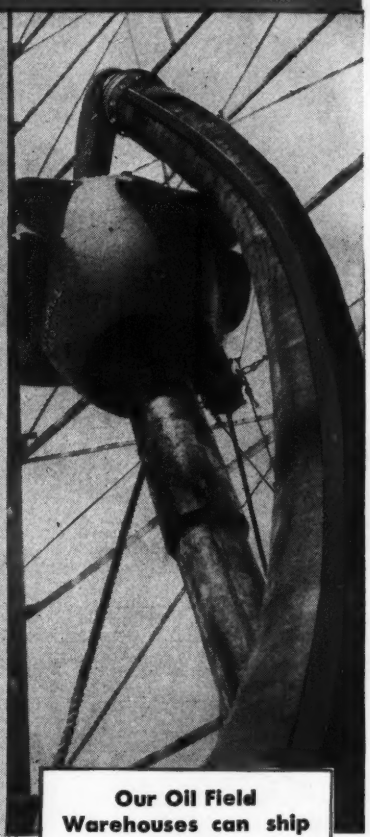

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San Joaquin Valley

Race Track Project Idle

British-American Oil Producing and the Capital Co.'s Portals No. 23 in Sec. 3-30s-29e in the Race Track Hill area is idle at 4945 ft. The project found gray sand below the Vedder and the chances are it will later be whipped directionally and redrilled to a sub-surface location more favorable to production.

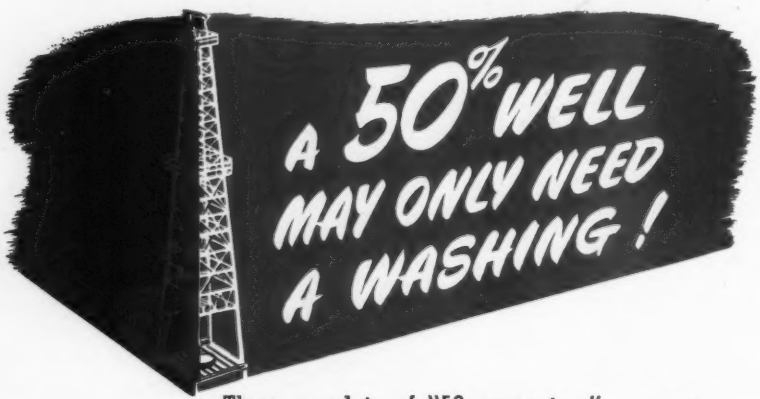
Maricopa Drill Scene

Rocket Petroleum Co., organized by Gene Reid, president of the Gene Reid Drilling Co. in Bakersfield, is starting a new shallow drilling campaign in the Maricopa area.

The company's leases includes the southwest quarter of the southwest quarter of Sec. 32-32s-24e. The southeast quarter of the southeast quarter of Sec. 31 is owned in fee. Locations have been made for Fee No. 1, No. 2 and No. 3.

Former owner of the properties was Fuller Petroleum Co. One well already has been reconditioned by Rocket and placed on production for 45 barrels daily, compared with a yield of 10 barrels before the well was worked over.

Standard of California's No. 29D in Sec. 29 is spot coring below 2850 ft. in gray shale. Formation test of the interval of 2500-2625 ft. showed little oil.



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Round Mountain Explorer Slated

On unproved ground east of the Round Mountain field, Independent Exploration is drilling Olcese No. 2 in Sec. 16-28s-29e below 500 ft. Location falls about 950 ft. north of Olcese No. 1, a dry hole given up at 1875 ft.

Cymric Well In Oil Sand

Signs to date promise another good producing well for Universal Consolidated on its Sauerdough lease in the Cymric field.

The company's current drilling job, Sauerdough No. 12 in Sec. 23-29s-21e, cored top Oceanic oil sand at 4760 ft. and at last reports still was in the zone at 4875 ft. Coring is continuing ahead.

Coles Levee Outpost Going

Union Oil's Kernco No. 54-12 in Sec. 12-31s-25e, an easterly outpost of the Coles Levee field, is making hole ahead below 9350 ft. in sand and shale.

Lost Hills Try Working

Electric log is being run in Richfield Oil's Frank Buck No. 1 wildcat in Sec. 6-27s-21e near the Lost Hills field. Total depth is 6762 ft.

Middle Dome Job Whipping

Standard of California, No. 73-30V discovery well in Sec. 30-23s-19e in the Middle Dome wildcat district of Kettleman Hills is preparing to set whipstock at 10,971 ft. and redrill. Drill pipe first was recovered to 11,060 ft. Total depth is 12,389 ft.

Arvin Active

After finding the Cattani sand all gray, Honolulu Oil is drilling ahead below 7150 ft. with Honolulu-General Petroleum-Derby No. 1 in Sec. 15-31s-29e in the Arvin area. The well probably will be carried to basement. Hancock Oil's Di Giorgio No. 1 in Sec. 4-31s-29e is down 6417 ft. in hard schist. Universal Consolidated's Derby No. 2 in Sec. 15 is drilling at 6250 feet. Northeast of Arvin, Louis H. Didier is drilling at 750 ft. with No. 1 in Sec. 10.

Panoche Creek Test Scheduled

Seaboard Oil is making ready to start Lillis No. 64-36, a wildcat test located in Sec. 36-15s-12e near Panoche Creek in Fresno County. It will aim for the Cretaceous where Jergins Oil's Cheney Ranch No. 2 in Sec. 29-14s-13w found some sand. It was completed for 10 barrels of 52 gravity oil and 564,000 ft. of gas a day.

Helm Explorer Sidewall Samples

Pacific Western, Summit Lake No. 1 in Sec. 14-17s-16e in the Helm area logged 9 ft. of oil sand in the Nortonville. On formation test of the interval of 8150-8210 ft., packer slipped after three minutes. Recovery was 200 ft. of mud. Sidewall sampling now is under way.

Edison Test Ends Oil Hunt

Fred E. Stewart's quest for new oil southeast of the Edison field through the medium of Thomas No. 1 in Sec. 27-30s-30e has been abandoned at 605 ft. The project has been idle for more than a month.

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Bacon Hills Well Working

Seaboard Oil's Seaboard-Bandini No. 3-21 in Sec. 21-28s-20e in the Bacon Hills area, whose substantial oil flow soon turned mostly to water, is ready to start remedial work.

The zone tested probably will be plugged off near 7800 ft. with shooting, squeezing and normal trials following.

Where the water broke in is yet to be determined. It is not believed, however, that it is coming from the oil formation, but from above, due to a bad cement job.

The well when first tested looked like a major discovery. For a time flow was rated at 500 barrels of 38 gravity clean oil a day. Accompanying gas yield was excellent.

Total depth is 8477 ft. and plugged back depth 7925 ft. Tubing is hung at 7443 ft. with holes shot in the interval of 7846-7876 ft.

Amerada Completes Riverdale Producer

Amerada Petroleum has finished Young No. F-41 in Sec. 16-17s-19e in the Riverdale field at 6900 ft. for a flow of 145 barrels of 35 gravity oil and 194,000 cubic ft. of gas on a 15-hour gauge. The well was spudded March 19.

Edison Wildcat Pumping To Sump

West of the Edison field, Union Oil's Porter No. 74-28 on wildcat ground in Sec. 28-30s-29e has been completed pumping 95 barrels of 23.2 gravity oil to sump from a redrilled depth of 4043 ft.

Temblor Try Hits Gray Sand

Having cored gray sand, Gannon & Aslin has abandoned No. 69J in Sec. 36-29s-20e in the Temblor area at 524 ft.

Kern River Wells Planned

Crude Oil Production Co., Bakersfield, has taken over the von Glahn and Frank property in the Kern River field in Sec. 8. There are 3 producing wells on the lease and several more are in line for drilling.

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Midway-Sunset Test Planned

Pasadena Petroleum Corp. has obtained a lease on a 160-acre piece in Sec. 4-11s-26e northwest of the Midway-Sunset field, with a wildcat venture in view.

Mountain View Venture Deeper

Hancock Oil's Di Giorgio No. 1, which hit the Schist at 6200 ft. is still making hole in this formation at a depth of 6450 ft. Drilling is tough enough to call for a bit every 5 or 7 ft. of hole.

Cymric Field Complexities

Almost every well drilled in the Cymric field appears in the wildcat class due to faulting and other complexities displayed there.

Independent Exploration, Roco No. 3 in Sec. 18-29s-21e drilled into a fault with no Carneros sand present. Total depth is 2515 ft. in Santos shale. Roco No. 4 found the Carneros gray and has been given up at 2319 ft. Texas Co., Anderson No. 63 in Sec. 20 has been completed flowing 152 barrels through a 10/64-in. choke. Superior Oil's F. W. No. 26-23 is drilling at 2100 ft.

San Joaquin Adds New Well

Superior Oil's Keisson No. 35-32 in Sec. 32-15s-17e in the San Joaquin area of Fresno County, has been completed and presently yields 200 barrels of 31 gravity oil a day under extreme restrictive choke. Total depth is 7076 ft. The producer is an offset to the Hakala discovery well located about 1200 ft. west.

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San Emigdio Try Fishing

Fishing for drill pipe is the latest word from Continental Oil's KCL No. L-1 in Sec. 11-11n-22w in the San Emigdio area, Kern County. Bottom is 10,424 ft.

Sand Hills Try Digging

Drilling has reached 9150 ft. and is continuing a normal pattern ahead in Western Gulf's S. P. No. 1 in Sec. 25-12n-20w in the Sand Hill area.

Poso Creek Leasing Area

Gene Reid Drilling Co. is understood as having sold to Oceanic oi its half interest in the west half o: Sec. 33-28s-20e in the Poso Creel area. Developed by Reid in company with Independent Exploration the lease boasts no less than 9 producing wells.

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Coastal and Northern District

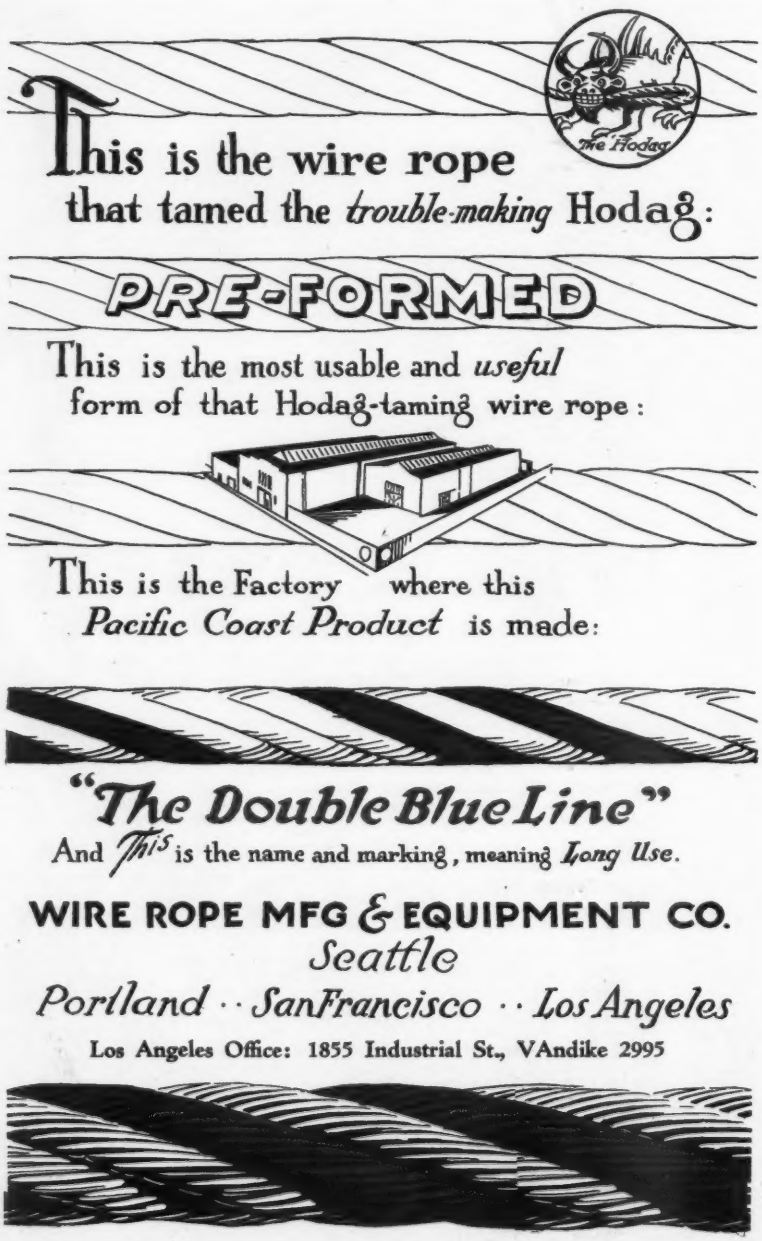
Dixon Job On Program

Amerada Petroleum has location staked for Geithle No. 1 in Sec. 5-6n-2e in the Dixon area, Solano County. Wineman Comm. No. 1 in Sec. 22 has been given up after prospecting to 4815 ft. On formation trial of an interval near bottom, recovery was salt water.

West Mountain Well Drills On

Ring Oil Co., Synd., S. P. No. 1 in Sec. 23-3n-21w on wildcat ground in the West Mountain area, Ventura County, is making hole on down at 5010 ft.

George and Frank Ring, Ring organization executives, discerned the production possibilities of the area under questioning more than 25 years ago. A portion of their original holdings is the scene of Union Oil, Freeman Fairfield, D. D. Feldman and Los Nietos Co. production.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Piru Creek Try Starts

Foundation is in for Bolsa Chica Oil Corp's. No. 76-32 in Sec. 32-5n-18w in the Piru Creek area, Ventura County.

San Miguel Test Failure

On the Bradley Anticline near San Miguel in San Luis Obispo County, E. B. Hall & Co. has called it quits at approximately 3400 ft. with Mahoney No. 36-2 in Sec. 2-25s-12e. Shallow oil showings failed to measure up to commercial standards.

Zaca Creek Project Digs

Near Los Olivos in the Zaca Creek area, Tide Water Associated is prospecting ahead below 1650 ft. with Quati No. 75 in Sec. 34-8n-31w, Santa Barbara County. The well is located south and east from the northwest corner of the Davis lease.

Monterey Co. Test Drilling

Shell Oil's interesting search for new oil in Thompson Gulch not far from King City continues to make progress. The well at last reports was down 6450 ft. It is known as Shell-Honolulu-Thorup-USL No. 1 and located in Sec. 4-20s-7e. Texas Co.'s Currell No. 2 in Sec. 4-21s-8e is a location.

Humboldt Co. Test Gives Up

Texas Co. has abandoned its Anderson No. 1 in Sec. 8-2n-1e in the Hydesville area of Humboldt County. It was carried originally to 9082 ft. and subsequently redrilled to 8769 ft. Showings were encountered, but they were of little consequence.

Fillmore Well Tests

Jahns Oil Co., Goodenough No. 1 test in Sec. 18-4n-19w north of Fillmore is interrogating splice on 995 ft. of 4¾-in. liner landed at 2205 ft. Total depth is 2210 ft.

Orcutt Venture Coring On Down

On the Los Flores Rancho southeast of the Orcutt field, Sunray Oil Corp. is coring No. 1 test in Sec. 4-8n-33w at 3819 ft. The company is seeking to develop production similar to that established in the Orcutt field.

Montalvo Wildcat Completed Flowing

Standard of California's McGrath No. 2 in Sec. 26-2n-23w in the Montalvo area in Ventura County is reported to have flowed oil in substance on test at a plugged back depth of 8660 ft. The crew has moved out and indications are that the well will be put on regular production at some later date. Original bottom is 11,505 ft.

West Mountain Tests Working

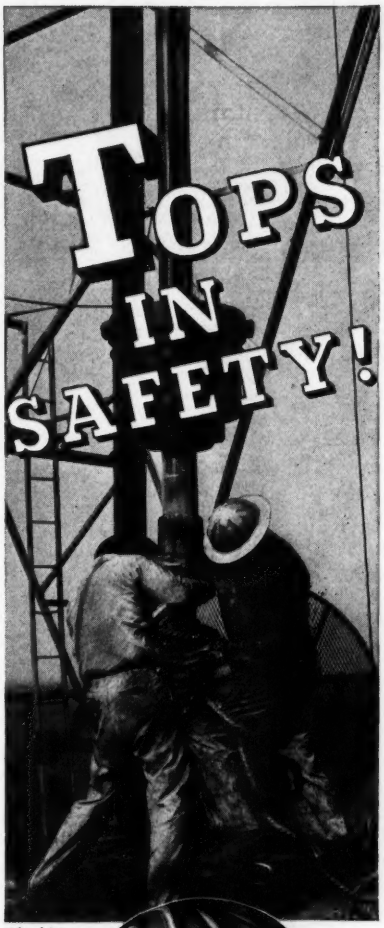
Los Nietos Co. & Lucy Smith Battson, C. & H. No. 3 in Sec. 23-3n-21w near West Mountain is swabbing for production from a plugged depth of 5039 ft. Total depth is 5181 ft. Richfield Oil's Saticoy No. 1 in Sec. 22 is making hole ahead below 3400 ft.

Santa Maria Well Abandoned

Fleisher No. 10, sponsored by Union Oil in Sec. 31-10n-33W in the Santa Maria field, has been abandoned at 4780 ft., following an electric log run.

Cat Canyon Well Boring

Douglas Oil Co., headed by W. G. (Woody) Krieger, is going on down at 4750 ft. with Los Flores No. 1 in Sec. 27-9n-33w in the Cat Canyon area. General Petroleum is grading for Dominion No. 44-14 in Sec. 14.



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Goleta Prospects Going Steadily On

Honolulu Oil Corp., Honolulu-Signal-Goleta Comm. No. 1 in Sec. 24-4n-29w in the Goleta area, Santa Barbara County, has reached a depth of 5500 ft. and is continuing to prospect ahead. Honolulu-Signal-Macco State No. 308-1 in the section is exploring below 1850 ft.

Arroyo Grande Well Rigs Pump

With hole bottomed at 1286 ft., Adams Oil Co. is rigging to pump Dolley No. 5 in Sec. 6-32s-13e in the Arroyo Grande field. No. 6 has been spudded and has reached 500 ft.

Bardsdale Job Making Progress

W. H. (Bill) Geis' Robertson No. 1 in Sec. 12-3n-20w at Bardsdale is pushing ahead near 5300 ft. Union Oil's Dryden No. 12 on Sec. 12 is yet a location.

Oxnard Well Rigging Up

Derrick is being rigged for C. L. Riley Co.'s Cal Lands No. 1 in Sec. 5-1n-21w in the Oxnard area. San Miguel Oil Corp. has location made for Todd No. 2 in Sec. 6.

Capitan Test Drilling Ahead

Rothschild Oil Co., producing and marketing organization, is drilling Orella No. 2 in Sec. 31-5n-30w in the Capitan area at 2750 ft. No. 1 is shut in, after completing at 3119 ft.

Butte County Test Moves On

General Petroleum is making ready to carry deeper its Llano Seco No. 1 wildcat test in Sec. 33-20n-1w on the historic Llano Seco Rancho in Butte County. Present depth is 5455 ft.

Yolo County Try Drilling

Near Winters in Yolo County, Shell Oil continues to make satisfactory drilling progress with its Winters Comm. No. 4-1 in Sec. 19-8n-1e at 3250 ft. in sand and shale.

With Drilling Contractors

American Association of Oilwell Drilling Contractors' seventh annual meeting will be held at Long Beach on October 13-15.

This was assured when directors of the association at the recent gathering of contractors in Tulsa voted unanimously in favor of the California beach city for the 1947 convention. The association's California chapter also evidenced its choice of Long Beach for the affair by a unanimous vote.

The Tulsa meeting was given over largely to discussions on the association's research, insurance, accounting, safety and mud school projects. Various reports agreed that excellent progress is being made in work now under way.

The contractors decided to continue the association's membership in the National Petroleum Council, and the president of the drilling organization was authorized by directors to attend at least every other meeting of the Federal oil agency.

E. C. Brown, president of the widely known Brown Drilling Co. in Long Beach, was among association directors present at the Tulsa gathering.

The next directors meeting will be held in Shreveport, La., in the first part of July. Brad Mills, executive vice president of the association, has announced.

The meeting of the California chapter of drilling contractors at the Lakewood Country Club in Long Beach was centered on a thorough airing of current problems, peculiar to the contractor.

Kern Drilling Corp. of Long Beach has started work on an interesting contract job with Far East Oil Development Co., Inc., a Philippine corporation with headquarters in Manila.

Three exploratory holes have been mapped out for the Philippines. The first, called Cebu No. 1-A, will look for oil on the northern tip of the island of Cebu.

The drilling crew was sent to the islands from Long Beach. It is made up of drillers, a toolpusher and mechanic. Development work will be supplemented by native labor.

A Super-Titan Wilson Diesel-driven rotary outfit is on the ground for the initial test.

Far East Development was drilling a well on the island of Cebu when the Japanese struck at Pearl Harbor. Operations kept on without interruption until by General MacArthur's request the rig was demolished. This move narrowly beat the arrival of the soldiers of Nippon.

Van Noy Drilling Co., Long Beach, was recently organized to engage in contract drilling of shallow oil or water wells. Headed by C. K. Van Noy, the company has light equipment designed to go 1200 ft. Some water wells for the Navy at Wilmington are planned.

Contract oil well drilling is being undertaken by Cal Oil & Gas Co., Turlock. The company has a unitized mobile drilling rig capable of going to 4000-ft. depths. Dr. C. W. Farmer is president, Ray Van Sandt, vice president and superintendent; and R. E. Peterson, secretary.

Severns Drilling Co., which has been identified with many important wells in recent months, gained new laurels when it brought to successful conclusion British-American Oil Producing and The Texas Co.'s Bodger No. 3 at Alondra Park.

Although much of the history of the drilling branch of the petroleum industry has been carefully recorded, many innovations and events associated with the development of oil have been lost in the pages of time.

The American Iron and Steel Institute recently pointed out that when, how and where rotary drilling methods were first applied is something of a mystery.

"In the background," the institute said, "is a man named Kelly, a mysterious figure who gave the oil industry some of its curious terminology. He must have contributed to the science and mechanics of rotary drilling—and then dropped into obscurity. All that oil history gives him is a scant, unrevealing credit line."

Probably at some time or another every contractor has speculated as to who was Kelly and just why the grief stem was named for him.

Rocky Mountain Drilling has finished Richfield's Unit No. 4 at East Los Angeles as an excellent producer. Current jobs of the company include Standard's Six Co. Fee No. 3 at El Segundo, Sharples Oil's Hyde No. 1 at Northeast Coalinga and Shell's Winters Comm. No. 4-1 at Winters. The company is carrying forward many other jobs in various areas.

Independent Exploration and Bandini Petroleum's important wildcat near the Wheeler Ridge field is going ahead on contract to Clyde Hall Drilling.

K. L. Kellogg & Sons, which is engaged in contract jobs everywhere in the state and elsewhere, is carrying forward to conclusive depths Western Gulf's prospects in the Sand Hills area, Kern County.

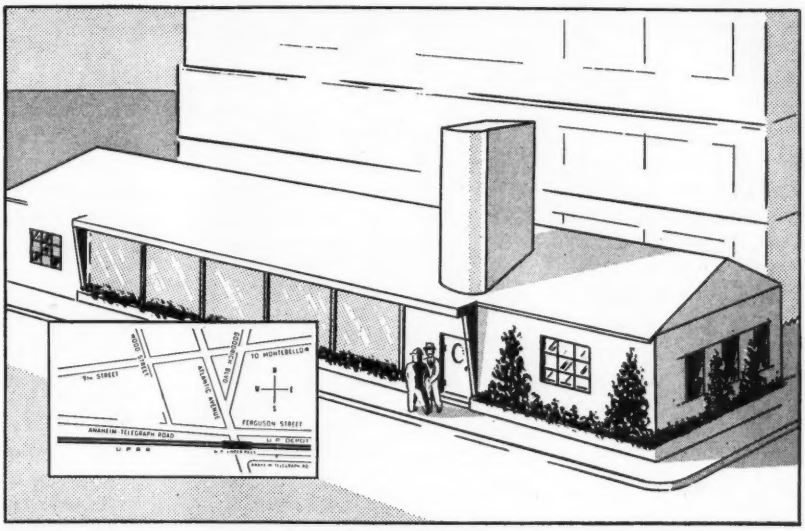
Power Rig & Equipment Company Succeeds H & B Sales Company

E. W. "Al" Farrow of H & B Sales Company announced April 21 the reorganization of the company and the change of name to Power Rig & Equipment Company, Incorporated. Mr. Farrow stated that the firm has moved to their new building located at 5131-41 Anaheim-Telegraph Road. Due to their new and enlarged facilities they have expanded their services to the oil industry.

"Our new policy with reference to our distributorship of Wilson Manufacturing Company's equipment now makes it possible for us to do special fabricating and assemblying jobs to meet the particular requirements on the West Coast. It is our intention to assemble to order all types of production hoists and masts, as well as other Wilson production equipment. At the same time, we will be able to carry a complete stock at all times of Wilson's widely-known equipment."

According to Mr. Farrow, enlarged service, manufacturing, and assembly departments will now be able to furnish accessories and supplies in many types and sizes. Equipment such as rig bases, skid mounts, engine houses, ladders, runarounds, mud units, generator units, etc., will be built to exact customer specifications.

Mr. Farrow pointed out that their new office facilities will expedite the handling of business and, at the same time, their modern plant layout will be able to give immediate attention to every requirement of the oil industry. Power Rig & Equipment Company looks forward to the inspection of their new facilities by all of their old friends and customers, stated Mr. Farrow.



New and greatly enlarged headquarters of the Power Rig & Equipment Company

New "Aerated" Gun Grip For Steam Cleaners

All Tivit Steam Guns are now equipped with a new patented "Aerated" gun grip. This is said to be the coolest, safest, and easiest to handle grip ever devised for manipulating steam guns.

This simple device is constructed of perforated material which permits free circulation of air around the steam pipe. Further coolness is built in by the use of phenolic discs to insulate the grip from the pipe. The elimination of the rubber covering in use for many years has made possible the reduction in the size of the grip. Now it can be held comfortably in the average hand without the usual tiring effects. It is no longer necessary to wear gloves while operating the steam gun.

The improved patented grip means no change in the design of the gun itself. The rear grip is stationary while the forward one swivels. Retaining collars are set to space the grips to suit the operator's arm length.

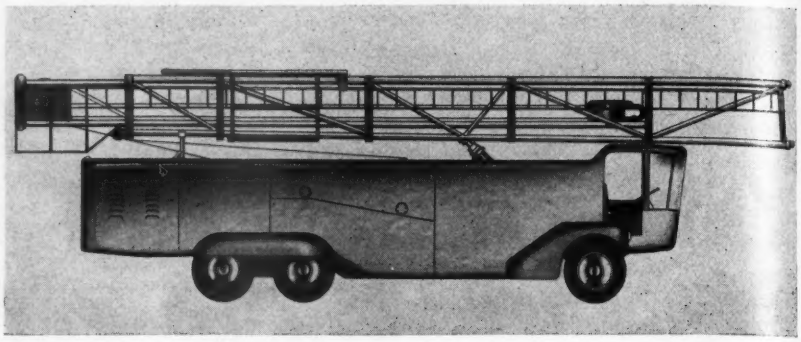
Combined with the high velocity Tivit HY-VEL Nozzle, the new grip design makes the Tivit Gun the most efficient steam cleaning gun ever developed, states Tivit Products Company, Los Angeles manufacturer.

New Development In Portable Servicing and Drilling Rigs

The Model 321, new and revolutionary self-propelled servicing and drilling rig, has been announced by the Waldrip Engineering Company. This unit is designed to service wells to 4,000 feet and to clean out, deepen and work over wells to 2,500 feet. It has a design net hook horsepower of 117 H.P. and will start 4,000 feet of 2½" tubing off bottom at 90 feet per minute with three lines up.

The Model 321 is comprised of a double drum hoist with single engine drive, torque converter of gear transmission, right angle gear box and portable telescoping derrick of unusual design, all integrally mounted on a streamlined six wheel

chassis. Rotary countershaft with propeller shaft rotary drive and regular and automatic catheads are offered as accessory equipment. Speed of moving and erection has been a prime consideration in the design.



Outstanding features of the Model 321 are that it drives into the location nose first instead of backing in. This provides easier, faster spotting of the unit at the well location. Functional design provides better balance with less weight. There is less load over the front wheels. Power controls are placed at the derrick leg to allow the best possible operating vision. Motor positioned at rear of unit is easily accessible, completely guarded by smooth, streamlined contour guards. It is available with gas, gasoline, butane or Diesel engine and with either a torque converter or gear box at the operator's option. This light weight unit complies to California Highway regulations when equipped with Waldrip-Western 65′, 60,000 lbs. or 90,000 lbs. hook load capacity telescoping derrick.

The Model 32, now in production, is the first of a complete line of self-propelled servicing and drilling rigs.

World's Largest Drilling Rig

The recent completion, testing, and delivery of the world's largest drilling rig is announced by Emsco Derrick & Equipment Company of Los Angeles, Houston, and Dallas. Known as the J-2000, this new rig is designed and constructed to meet the requirements of safe, efficient and economical drilling to depths in excess of 20,000 feet. It is stated that rigs of this series are now a regular production item at the company's main plant in Los Angeles.

Incorporating all proven, basic features of Emsco "J" series drilling rigs, the new J-2000 is a 2000 horsepower unit which may be powered by either internal combustion engines, steam engines or electric motors. With internal combustion engines a selective transmission is used—engines being compounded through a compounding transmission driving slush pumps, draw works and rotary machine.

The Emsco J-2000 Draw Works has direct air-operated clutches on all drum and rotary drives. All controls are arranged in a convenient manner at the driller's position. Variable pressure valves control friction clutches. All drives are totally enclosed and flood lubricated. On the rotary side of the drum shaft there is a jaw clutch for engaging a 40″ double hydromatic brake or a 60″ Dynamic Electric brake. This jaw clutch is air-operated when used in conjunction with a hydromatic brake.

General specifications for the J-2000 are as follows:

Hoisting Speeds: 6 with Int. Comb. Eng.—4 with Steam.

Rotary Speeds: 6 with Int. Comb. Eng.—4 with Steam.

Brake Rims: 60″ dia. × 9½″ face (water cooled).

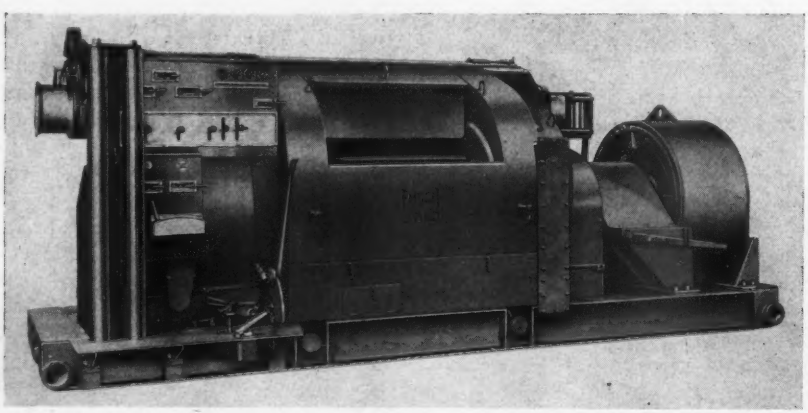
Drum: 34″ dia. × 59¾″ long (smooth or grooved).

Chain: 3⅛″ single and triple.

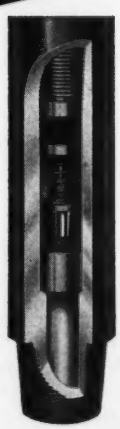
Main Skids: 23′3″ long, 14″ × 10″ WF 68 lb. Beams.

Bearings: SKF self aligning roller.

Complete information and detailed specifications are available upon request. Emsco Derrick & Equipment Company, Los Angeles, California.



I'm a popular guy with fast-moving, safety-minded crews because I . . .



Prevent Plugged Bits

•

Avoid Pulling Wet Strings

•

Relieve Weight on Derrick

•

Lengthen Life of Lines and Brake Bands

BAKER "Bakwik" DRILL PIPE FLOAT

ASK THE BAKER MAN

Axelson Commences Production of "Oil Country" Hollow Spindle Lathe

Designed to meet special requirements of the oil industry and to work on such long members as the oilfield "kelly," and other oilfield tool-joint jobs, a hollow spindle "Oil Country" lathe is announced by the Axelson Manufacturing Company, of Los Angeles, California. This is an addition to Axelson's long-time-tested heavy duty engine lathe line. These latter lathes have been manufactured and both steadily and actively improved during 25 of the 55 years of Axelson operations.

Production of the new lathe follows years of planning and a long period of pilot operation in the proving ground of varied and practical use. The traditional Axelson "quality first" standards, which have carried the firm's heavy duty line into the forefront of recognition among blue-ribbon industries of the world, have been maintained in producing the new hollow spindle lathe.

The new machine is manufactured in two sizes, a 20" lathe with 24 speeds and a 25" lath with 16 speeds. Beds are of massive rigidity, giving the fullest support to the rest of the lathe assembly and maintaining perfect alignment under any strain or stress of heavy-duty cutting. Casting of these beds and of all other cast parts of the lathe, is done in the model Axelson foundry, under the eye of men long trained to maintain the quality of work demanded in Axelson iron and semi-steel foundry products.

Lead screws are turned and ground before threading while preloaded and adjustable thrust bearings are provided at each end of the screw. The feed rod is used for all work except threading. Headstock ease is a one-piece oil tight unit in which the mounting of the hollow spindle is handled by two sets of Timken precision bearings. The forged alloy steel hollow spindle is ground to close tolerances and all gears in the spindle driving train are of alloy steel, carburized, hardened and profile ground. Four levers control both the 24 and 16 spindle speeds.

To meet the special requirements of an Axelson customer, one of the earliest of these lathes was manufactured with a length of 38 feet, by introducing additional 2-foot bed increments. This length of bed for the custom job, gives it the rating of the largest machine tool ever produced on the Pacific Coast, according to qualified authorities. This special machine further demonstrates the massive strength of a bed able to maintain perfect alignment of parts, in a heavy-duty lathe of this overall length. The hollow spindle job carries all of the advantages of the well known Axelson lathes, manufactured for years in six popular sizes.

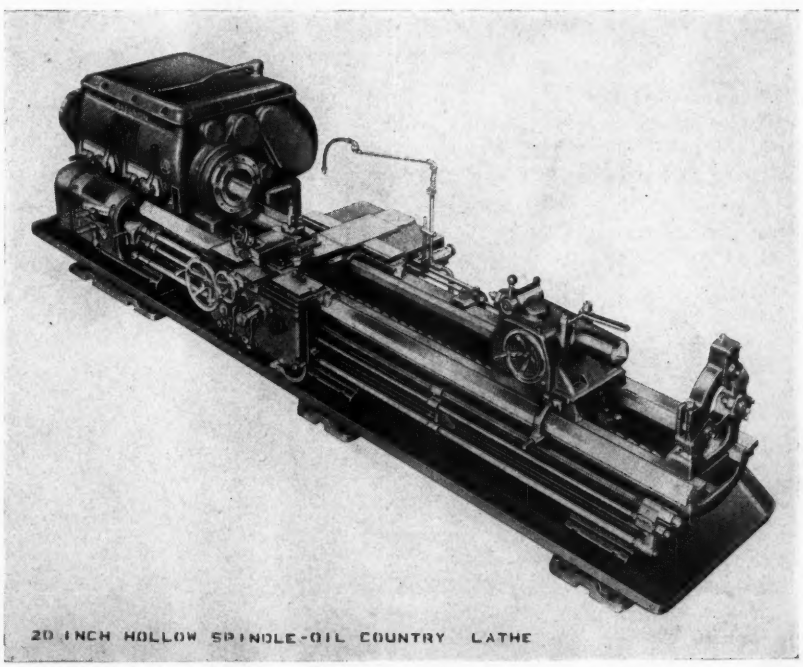
Power is transmitted from the motor by means of multiplate forward and reverse clutches. The automatic spindle brake is synchronized with the main driving clutches, permitting rapid stop and reversal of spindle rotation.

Some of the success of the Axelson "Oil Country" lathe is credited, by the manufacturers, to their long experience in the manufacture of subsurface equipment for oilfields in all parts of the world. Adding together the great experience of the Axelson Company in both the oilfield and machine tool industries, the result promises to prove of exceptional advantage to the oilfield users of the hollow spindle lathe.

In 1892 Charles F. and Gustavus A. Axelson, brothers, moved from Topeka, Kansas, to Santa Ana, California and purchased a small machine shop which later became the Axelson Manufacturing Company. An amazing growth, based on good workmanship and unbounded enterprise, raised the Axelson status from the original two-man shop to the present 10-acre home plant at 6160 South Boyle Avenue, Los Angeles, California.

The Los Angeles plant contains one of the west's largest aggregations of machine tools; a complete foundry and a gage making division. J. C. Axelson, president and general manager of the company and his brother, D. F. Axelson, vice-presidents, are sons of Founder C. F. Axelson. A grandson, J. L. Axelson, son of D. F., also is active in the company.

M. K. Doumani has been elected a director of Merchants Petroleum Co. He is president of Pedro Petroleum Co., owner of Santa Fe Springs production.

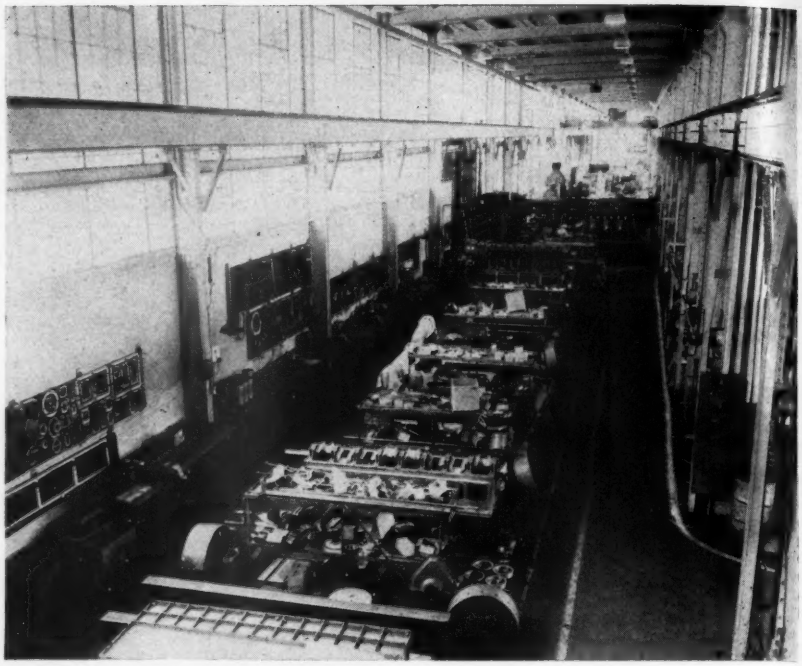


20 INCH HOLLOW SPINDLE-OIL COUNTRY LATHE

Superior Engine Division Speeds Production

From a stripped engine bed to a completed engine on a flat car, Diesel and gas engines now are produced on this modern assembly line at the Superior Engine Division plant of The National Supply Company. In this department where formerly ten men could work on the assembly of five engines, fifteen engines now move at the same time down the line as more than double the number of craftsmen assemble them.

This modernization and expansion was made possible after Superior sold the manufacturing rights to its line of high speed engines so that the company could concentrate on manufacturing medium and slow speed, heavy duty diesels. Photo No. 1 shows how the engines formerly were built up part by part from assembly racks. The other photo shows the same room as it is today with the engines being assembled as they move down the line. At the end of the line the last part, the cylinder head cover, is put on the diesel and it is moved to the test stand. After test approval and painting, the engine is moved directly onto a flat car for shipment.



Medium speed diesels and G-510 gas engines used for drilling oil wells, and medium speed diesels for marine and industrial installations, are assembled on this line.

The new production line is one of a series of improvements being made at the Springfield plant. The company has provided $1,525,000 for a plant improvement program which already is well under way and is expected to be completed late this year. More than half of this sum is for plant expansion and the rest for modernization and improvement of existing facilities.

Earl Gilmore, dean of California oil producers and veteran member of the petroleum industry, has been appointed campaign chairman of the Salvation Army building fund campaign in the Los Angeles district. The drive opens in the middle of May.

THIS LAUGH

OFF!!

There he was—the Scotchman who was pummeled nearly to death because he thought the sign on the door read "Laddies."

Breathes there a man so much abnormal
That he can't be stirred by a low-cut formal?

The only difference between Little Red Riding Hood and the girls nowadays is that she had only one wolf to worry about.

"I put my husband in the hospital because of his knee."
"Water on it?"
"No, private secretary."

"I just got out of prison this morning," a traveler told a man on a train. "It's going to be tough, facing old friends."
"I can sympathize with you," commiserated the other. "I'm just getting home from Congress."

Conductor: How many in this berth?
Passenger: Just one. Here's our ticket.

Teacher: Give me a sentence containing a direct object.
Junior: Teacher, you are very beautiful.
Teacher: What's the object.
Junior: A good report card.

A custom's officer, while examining a sailor's baggage, discovered a bottle of whiskey. "I thought you told me there were only night clothes in that suitcase?
"Right," replied the gob, "that's my night cap."

Hint to young wives: If your husband refuses to wipe the dishes, claiming that is not a man's job, politely hand him the Bible and point out II Kings 21:13: "And I will wipe Jerusalem as a man wipeth a dish, wiping it and turning it upside down."

She: "Sometimes my father takes things apart to see why they don't go."
He: So what?"
She: 'So you'd better go."

She: "No bachelor can understand women."
He: "Is that so? What else do you suppose makes a man a bachelor?"

Pedro was proudly describing the new house he had built to his friend Jose.
"Is it a large hacienda or a small hacienda?" Jose asked.
"Well, it isn't so large, but it isn't so small either," Pedro said. "It's sort of a half-hacienda."

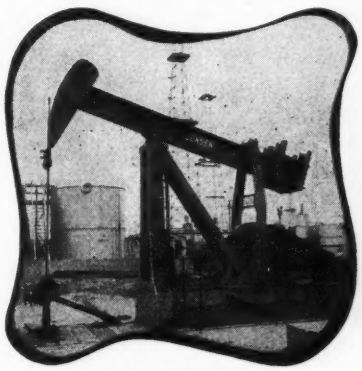
A lady left New York for Sao Paulo to have a good time. She attended a carnival and paraded the streets at night, singing and dancing. Next day she went to the bank and asked the teller:
"Is this 5,000 reis?"
"Yes, Madam," the teller assured her.
"Will you give it to me in American money?" she asked.
He gave her 57 cents and she stood and stared at it for a long time.
And I gave him his breakfast, too," she said angrily, walking away.

A woman called up a newspaper and told them she wanted her husband's name put in the obituary column because she caught him kissing the maid.
"How long has he been dead?" asked the reporter.
The wife replied: "He starts tomorrow."

If a poor man cannot always get meat he is no worse off than the rich man who cannot always digest it.

When are you going to stop running after women?
When they stop running.

I was down in the dumps all day yesterday.
Did you find anything?



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How do Jensens reduce pumping costs?

To start with you have a reasonable initial cost. From there you get the benefit of lower maintenance, reduced power bills, less wear and tear on wire line, stuffing box, and polish rods.

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California Oil World's Monthly Summary

DEVELOPMENT—PRODUCTION—SUPPLY & DEMAND
PACIFIC COAST TERRITORY

TABLE I—CALIFORNIA DEVELOPMENT—PRODUCTION

	FEBRUARY, 1947 DEVELOPMENT				PRODUCTION	
	Active Drilling Wells	Oil Wells Completed	Initial Production B/D	Oil Wells Completed First 2 Months	Daily Average February 1947	Daily Average February 1946
SAN JOAQUIN VALLEY REGION						
Ant Hill	.....	.....	.....	1	1,626	1,280
Bellevue	.....	.....	.....	.....	311	443
Belridge—North	.....	.....	.....	.....	5,081	5,243
Belridge—South	2	4	77	7	10,215	11,086
Blackwell's Corner	.....	.....	.....	.....	214	222
Buena Vista Hills	1	1	32	4	48,902	40,600
Canal	.....	.....	.....	.....	2,021	2,873
Coalinga Group						
Eastside	2	.....	.....	.....	16,209	17,698
Oil City	.....	.....	.....	.....	96	104
Coalinga—Nose	.....	.....	.....	.....	51,718	45,769
Coalinga—Northeast	.....	1	264	1	8,008	7,992
Pleasant Valley	.....	1	398	1	3,835	3,659
Jacalitos	3	1	62	2	4,209	4,533
Westside	.....	.....	.....	1	6,755	6,947
Coles Levee—North	3	.....	.....	.....	16,103	15,178
Coles Levee—South	1	1	316	1	2,738	2,033
Edison	.....	2	1,983	6	12,155	13,628
Elk Hills	4	.....	.....	1	8,484	14,245
Fruitvale	.....	.....	.....	.....	6,689	8,026
Greeley	.....	.....	.....	.....	10,149	10,846
Helm	1	.....	.....	1	4,197	3,994
Kern Front	.....	3	70	6	8,955	8,588
Kern River	2	.....	.....	3	9,854	10,067
Kettleman North Dome	4	2	727	3	37,848	39,310
Lanare	.....	1	62	1	2,463	1,385
Lost Hills	4	15	366	17	4,265	3,586
McKittrick Group						
Cymric	2	7	1,012	13	12,763	4,473
McKittrick	.....	.....	.....	.....	2,883	3,068
McKittrick Front	.....	.....	.....	.....	1,386	1,374
Salt Creek	2	9	3,185	12	3,964	8
Sheep Springs	.....	.....	.....	.....	370	529
Temblor Ranch	.....	.....	.....	.....	119	16
Midway-Sunset	6	4	191	6	43,118	39,723
Mt. Poso Group	.....	.....	.....	.....	14,906	17,483
Mountain View	3	.....	.....	4	4,438	3,073
Paloma	7	5	107	7	7,742	4,807
Poso Creek Group	1	2	142	4	3,717	3,686
Pyramid Hills	.....	.....	.....	.....	274	332
Race Track Hill	2	.....	.....	.....	2,158	854
Raisin City	.....	.....	.....	.....	2,720	2,466
Rio Bravo	.....	.....	.....	.....	13,063	13,870
Riverdale	.....	.....	.....	.....	4,148	3,491
Rosedale Ranch	.....	.....	.....	.....	106	81
Round Mountain Group	2	.....	.....	1	8,750	9,338
Strand	.....	.....	.....	.....	1,481	1,905
Strand—East	.....	.....	.....	.....	509	615
Tejon Ranch	1	3	602	5	2,667	862
Ten Section	1	.....	.....	.....	8,168	8,636
Union Avenue	.....	.....	.....	.....	348	182
Wasco	.....	.....	.....	.....	395	1,017
Wheeler Ridge	.....	.....	.....	.....	220	237
Williams	.....	.....	.....	.....	1,405	1,641
Other Fields	1	2	49	3	306	263
TOTAL—San Joaquin Valley Region	55	64	10,645	111	425,224	403,365
COASTAL REGION						
Santa Maria District						
Casmalia	.....	.....	.....	.....	333	36
Cat Canyon—East	.....	.....	.....	.....	262	584
Cat Canyon—West	6	3	542	5	10,756	7,953
Gato Ridge	2	.....	.....	.....	3,690	4,077
Lompoc	2	4	1,030	10	3,586	1,280
Orcutt	1	3	250	7	4,395	3,622
Santa Maria Valley	4	4	341	6	29,203	35,197
Zaca Creek	.....	.....	.....	.....	394	263

	FEBRUARY, 1947 DEVELOPMENT				PRODUCTION	
	Active Drilling Wells	Oil Wells Completed	Initial Production B/D	Oil Wells Completed First 2 Months	Daily Average February 1947	Daily Average February 1946
COASTAL REGION—Continued						
Santa Barbara District						
Capitan	.....	.....	.....	.....	2,959	3,372
Elwood	2	.....	.....	1	7,024	6,370
Santa Barbara	.....	.....	.....	.....	95	107
Summerland	.....	.....	.....	.....	2	.....
Ventura District						
Padre Canyon	3	1	411	1	2,771	2,731
Rincon	.....	.....	.....	.....	4,100	4,901
San Miguelito	2	.....	.....	.....	5,053	4,714
Ventura Avenue	8	6	3,652	10	45,218	46,412
North Santa Clara District						
Del Valle	4	4	448	5	7,635	6,322
Hopper Canyon	1	.....	.....	.....	184	131
Oak Canyon	.....	.....	.....	.....	1,695	1,815
Sespe Canyon Group	.....	.....	.....	.....	253	214
Temescal	.....	.....	.....	.....	612	677
Others	.....	.....	.....	.....	230	234
South Santa Clara Valley District						
Aliso Canyon	2	1	619	1	3,520	3,023
Bardsdale	.....	.....	.....	.....	404	519
Newhall-Potrero	2	2	1,001	2	6,279	5,679
Oxnard	.....	.....	.....	.....	1,230	1,095
Shiells Canyon	1	.....	.....	.....	1,068	1,467
South Mountain	2	1	294	2	4,462	2,909
Others	3	3	175	5	984	258
San Luis Obispo and Santa Clara Counties	.....	.....	.....	.....	29	63
TOTAL—Coastal Region	45	32	8,763	55	148,426	146,025
LOS ANGELES REGION						
Brea-Olinda	2	2	254	7	11,728	10,340
Coyote—East	1	.....	.....	4	5,014	4,867
Coyote—West	3	2	440	4	15,170	15,569
Dominguez	1	3	678	5	15,767	16,880
East Los Angeles	1	.....	.....	1	981	244
El Segundo	.....	.....	.....	.....	515	574
Huntington Beach	4	3	1,056	8	49,455	47,196
Inglewood	2	.....	.....	.....	11,858	13,728
Long Beach	2	.....	.....	.....	24,324	25,799
Montebello	.....	.....	.....	1	7,776	9,223
Newport	3	15	2,680	26	8,606	3,085
Playa Del Rey	.....	.....	.....	.....	2,144	2,450
Potrero	.....	.....	.....	.....	829	1,038
Richfield	1	1	50	4	6,708	7,209
Rosecrans-Athens Group	.....	.....	.....	.....	4,861	5,358
Santa Fe Springs	.....	.....	.....	.....	16,350	16,773
Seal Beach	3	3	2,749	3	11,872	9,888
Torrance	.....	.....	.....	.....	8,573	8,802
Whittier	.....	.....	.....	.....	1,006	1,040
Wilmington	15	13	8,520	29	122,048	96,462
Yorba Linda	.....	.....	.....	.....	221	240
Other Fields	2	.....	.....	.....	1,362	993
TOTAL—Los Angeles Region	40	42	16,427	92	327,168	297,758
EXPLORATORY						
Outpost Wells	32	.....	.....	.....	.....	.....
Wildcats	16	.....	.....	.....	.....	.....
Gas Wells	4	4	.....	10	.....	.....
TOTAL CALIFORNIA	192	142	35,835	288*	900,818	847,148

*—Includes gas wells completed and 49 drilling wells abandoned.

IN MEMORIAM

Joseph Mc Donald

April 26, 1868
Campsie
Scotland

November 3, 1946
Long Beach
California

Quality Oil Company
Taft, California